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**F.E. (Part – I) (New-CBCS) Examination, 2016
ENGINEERING MATHEMATICS – I**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
 2) Figures to **right** indicate **full** marks.
 3) **Use of non-programmable calculator is allowed.**
 4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

1) If $y = \sin^2 x$ then $y_n =$ _____

a) $-2^{n-1} \cdot \cos\left(2x + n\frac{\pi}{2}\right)$

b) $2^{n-1} \cdot \cos\left(2x - n\frac{\pi}{2}\right)$

c) $2^{n-1} \cdot \sin\left(2x + n\frac{\pi}{2}\right)$

d) $2^{n+1} \sin\left(2x - n\frac{\pi}{2}\right)$

2) If $a + ib = \frac{1}{2 + 2i}$ then $a^2 + b^2 =$ _____

a) 8

b) $\frac{1}{8}$

c) 4

d) $\frac{1}{4}$

3) The principal value of $\log(i) =$ _____

a) 0

b) $i\pi$

c) $2\pi i$

d) $i\frac{\pi}{2}$

4) If $y = \frac{1}{(x+3)^3}$ then $y_n =$ _____

a) $\frac{(-1)^n \cdot (n+2)!}{(x+3)^{n+2}}$

b) $\frac{(-1)^n \cdot (n+1)!}{(x+3)^{n+3}}$

c) $\frac{(-1)^{n-1} \cdot (n+1)!}{(x+3)^{n+3}}$

d) $\frac{(-1)^n \cdot n!}{(x+3)^{n+1}} \cdot 3^n$

5) The first three terms in expansion of $e^x \cdot \tan x$ are _____

a) $x + \frac{x^2}{2} + \frac{x^3}{3}$

b) $x + \frac{x^3}{3} + \frac{2}{5}x^5$

c) $x + x^2 + \frac{5}{6}x^3$

d) $x + \frac{x^3}{3} + \frac{x^5}{6}$

P.T.O.



- 6) $\text{Cosh}(x + iy) =$ _____
- a) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$ b) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$
 c) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$ d) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$

- 7) The value of $\lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ is _____

- a) $\frac{1}{6}$ b) $-\frac{1}{6}$ c) 0 d) $\frac{1}{3}$

- 8) If the characteristic equation of a matrix A is $\lambda^2 - 2\lambda + 1 = 0$ then

- a) $A^{-1} = A - 2I$ b) $A^{-1} = 2I - A$
 c) $A^{-1} = A^2 - 2A$ d) A^{-1} does not exist

- 9) The rank of the matrix $\begin{bmatrix} 2 & 2 & 2 \\ 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$ is

- a) 1 b) 2 c) 3 d) 0

- 10) Let A be 3×3 matrix of rank 3 then the solution of $AX = 0$ is

- a) No solution b) One independent parameter
 c) Three independent parameter d) A trivial solution

- 11) If $z = \log(x \tan^{-1} y)$ then $\frac{\partial^2 z}{\partial x \partial y} =$ _____

- a) $\frac{x}{1+y^2}$ b) $\frac{1}{x}$ c) $\frac{1}{x(1+y^2)}$ d) 0

- 12) If $u = \frac{\sqrt{x^3 + y^3}}{x + y}$ then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$ _____

- a) $\frac{3u}{2}$ b) $\frac{u}{2}$ c) 0 d) $2u$

- 13) If $u = x - y$, $v = xy$, then $\frac{\partial(u, v)}{\partial(x, y)} =$ _____

- a) $x - y$ b) $y - x$ c) 0 d) $x + y$

- 14) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to _____

- a) 1% b) 3% c) 2% d) 0%



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SECTION – I

2. Attempt **any three** of the following :

- a) Find n^{th} derivative of $\frac{x^2 + 4x + 1}{x^3 + 2x^2 - x - 2}$. 3
- b) If $y = \sin^2x \cdot \cos^3x$ then find y_n . 3
- c) Prove that $\sec^2x = 1 + x^2 + \frac{2x^4}{3} + \dots$ 3
- d) Expand $f(x) = x^5 - x^4 + x^3 - x^2 + x - 1$ in powers of $(x - 1)$ and hence find $F(0.99)$. 3
- e) Simplify $\left(\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}\right)^{4/3} + \left(\frac{1}{\sqrt{2}} - i\frac{1}{\sqrt{2}}\right)^{4/3}$. 3

3. Attempt **any three** of the following :

- a) Evaluate $\lim_{x \rightarrow 1} (1 + \sec \pi x) \tan\left(\frac{\pi x}{2}\right)$. 3
- b) Evaluate $\lim_{x \rightarrow 1} (1 - x^2)^{\frac{1}{\log(1-x)}}$. 3
- c) Solve $x^5 + 1 = 0$. 3



d) Show that continued product of all values of $\left(\frac{1}{2} - i\frac{\sqrt{3}}{2}\right)^{3/4}$ is 1. 3

e) If $\sin(\theta + i\phi) = P(\cos\alpha + i\sin\alpha)$ then prove that $P^2 = \frac{1}{2}(\cosh 2\phi - \cos 2\theta)$. 3

4. Attempt **any two** of the following :

a) If $y = \left(x + \sqrt{x^2 + a^2}\right)^m$ then prove that
 $(x^2 + a^2) y_{n+2} + (2n + 1) xy_{n+1} + (n^2 - m^2) y_n = 0$ and hence prove that
 $a^2 \cdot y_{n+2}(0) = (m^2 - n^2)y_n(0)$. 5

b) Expand $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ in powers of x . 5

c) If $\cos(x + iy) = \cos\alpha + i\sin\alpha$ then prove that : 5

i) $y = \frac{1}{2} \log \left[\frac{\sin(x - \alpha)}{\sin(x + \alpha)} \right]$

ii) $\cos 2x + \cosh 2y = 2$.

SECTION – II

5. Solve **any three** : 9

a) Reduce the matrix A to its normal form when $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ hence

find the rank of A.

b) Test for consistency and solve the following systems of equations
 $2x - y + 3z = 8$, $-x + 2y + z = 4$, $3x + y - 4z = 0$.

c) If $u = e^x (x \cos y - y \sin y)$ prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.



- d) If $z = f(u, v)$, $u = \log(x^2 + y^2)$, $v = \frac{y}{x}$ show that $x \frac{\partial z}{\partial y} - y \frac{\partial z}{\partial x} = (1 + v^2) \frac{\partial z}{\partial v}$.
- e) Find the maximum value of $f = x^2 y^3 z^4$, subject to the condition $x + y + z = 5$.

6. Solve **any three** :

9

- a) If $u = x^2 + y^2 + z^2$, $x = e^t$, $y = e^t \sin t$, $z = e^t \cos t$ find $\frac{du}{dt}$ in terms of t .
- b) If $u = x^2 - y^2$, $v = 2xy$ where $x = r \cos \theta$, $y = r \sin \theta$ find $\frac{\partial(u, v)}{\partial(r, \theta)}$.
- c) If $f(x, y, z) = x^3 y^2 z^4$ find approximate value of f when $x = 1.99$, $y = 3.01$, $z = 0.99$.
- d) Find the eigen values and eigen vector corresponding to largest eigen value

of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

- e) If $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$, find eigen values of A and A^2 .

7. Solve **any two** :

10

- a) If $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/6} + y^{1/6}} \right]$, find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$.
- b) Examine whether the following vectors are linearly independent or dependent. If dependent find the relation between them $[1, 0, 2, 1]$, $[3, 1, 2, 1]$, $[4, 6, 2, 4]$, $[-6, 0, -3, 0]$.
- c) Find the extreme values of $\sin x + \sin y + \sin(x + y)$.



- 6) If $u = x - y$, $v = xy$, then $\frac{\partial (u, v)}{\partial (x, y)} =$ _____
 a) $x - y$ b) $y - x$ c) 0 d) $x + y$
- 7) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to _____
 a) 1% b) 3% c) 2% d) 0%
- 8) If $y = \sin^2 x$ then $y_n =$ _____
 a) $-2^{n-1} \cdot \cos\left(2x + n\frac{\pi}{2}\right)$ b) $2^{n-1} \cdot \cos\left(2x - n\frac{\pi}{2}\right)$
 c) $2^{n-1} \cdot \sin\left(2x + n\frac{\pi}{2}\right)$ d) $2^{n+1} \sin\left(2x - n\frac{\pi}{2}\right)$
- 9) If $a + ib = \frac{1}{2 + 2i}$ then $a^2 + b^2 =$ _____
 a) 8 b) $\frac{1}{8}$ c) 4 d) $\frac{1}{4}$
- 10) The principal value of $\log(i) =$ _____
 a) 0 b) $i\pi$ c) $2\pi i$ d) $i\frac{\pi}{2}$
- 11) If $Y = \frac{1}{(x+3)^3}$ then $y_n =$ _____
 a) $\frac{(-1)^n \cdot (n+2)!}{(x+3)^{n+2}}$ b) $\frac{(-1)^n \cdot (n+1)!}{(x+3)^{n+3}}$ c) $\frac{(-1)^{n-1} \cdot (n+1)!}{(x+3)^{n+3}}$ d) $\frac{(-1)^n \cdot n!}{(x+3)^{n+1}} \cdot 3^n$
- 12) The first three terms in expansion of $e^x \cdot \tan x$ are _____
 a) $x + \frac{x^2}{2} + \frac{x^3}{3}$ b) $x + \frac{x^3}{3} + \frac{2}{5}x^5$ c) $x + x^2 + \frac{5}{6}x^3$ d) $x + \frac{x^3}{3} + \frac{x^5}{6}$
- 13) $\text{Cosh}(x + iy) =$ _____
 a) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$ b) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$
 c) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$ d) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$
- 14) The value of $\lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ is _____
 a) $\frac{1}{6}$ b) $-\frac{1}{6}$ c) 0 d) $\frac{1}{3}$



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SECTION – I

2. Attempt **any three** of the following :

- a) Find n^{th} derivative of $\frac{x^2 + 4x + 1}{x^3 + 2x^2 - x - 2}$. 3
- b) If $y = \sin^2 x \cdot \cos^3 x$ then find y_n . 3
- c) Prove that $\sec^2 x = 1 + x^2 + \frac{2x^4}{3} + \dots$ 3
- d) Expand $f(x) = x^5 - x^4 + x^3 - x^2 + x - 1$ in powers of $(x - 1)$ and hence find $F(0.99)$. 3
- e) Simplify $\left(\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}\right)^{4/3} + \left(\frac{1}{\sqrt{2}} - i\frac{1}{\sqrt{2}}\right)^{4/3}$. 3

3. Attempt **any three** of the following :

- a) Evaluate $\lim_{x \rightarrow 1} (1 + \sec \pi x) \tan\left(\frac{\pi x}{2}\right)$. 3
- b) Evaluate $\lim_{x \rightarrow 1} (1 - x^2)^{\frac{1}{\log(1-x)}}$. 3
- c) Solve $x^5 + 1 = 0$. 3



- d) Show that continued product of all values of $\left(\frac{1}{2} - i\frac{\sqrt{3}}{2}\right)^{3/4}$ is 1. **3**
- e) If $\sin(\theta + i\phi) = P(\cos\alpha + i\sin\alpha)$ then prove that $P^2 = \frac{1}{2}(\cosh 2\phi - \cos 2\theta)$. **3**

4. Attempt **any two** of the following :

- a) If $y = \left(x + \sqrt{x^2 + a^2}\right)^m$ then prove that $(x^2 + a^2)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$ and hence prove that $a^2 \cdot y_{n+2}(0) = (m^2 - n^2)y_n(0)$. **5**
- b) Expand $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ in powers of x . **5**
- c) If $\cos(x + iy) = \cos\alpha + i\sin\alpha$ then prove that : **5**
- i) $y = \frac{1}{2} \log \left[\frac{\sin(x - \alpha)}{\sin(x + \alpha)} \right]$
- ii) $\cos 2x + \cosh 2y = 2$.

SECTION – II

5. Solve **any three** : **9**

- a) Reduce the matrix A to its normal form when $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ hence

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6. Solve **any three** :

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- a) If $u = x^2 + y^2 + z^2$, $x = e^t$, $y = e^t \sin t$, $z = e^t \cos t$ find $\frac{du}{dt}$ in terms of t .
- b) If $u = x^2 - y^2$, $v = 2xy$ where $x = r \cos \theta$, $y = r \sin \theta$ find $\frac{\partial(u, v)}{\partial(r, \theta)}$.
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- d) Find the eigen values and eigen vector corresponding to largest eigen value

of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

- e) If $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$, find eigen values of A and A^2 .

7. Solve **any two** :

10

- a) If $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/6} + y^{1/6}} \right]$, find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$.
- b) Examine whether the following vectors are linearly independent or dependent. If dependent find the relation between them $[1, 0, 2, 1]$, $[3, 1, 2, 1]$, $[4, 6, 2, 4]$, $[-6, 0, -3, 0]$.
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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

1) The first three terms in expansion of $e^x \cdot \tan x$ are _____

a) $x + \frac{x^2}{2} + \frac{x^3}{3}$ b) $x + \frac{x^3}{3} + \frac{2}{5}x^5$ c) $x + x^2 + \frac{5}{6}x^3$ d) $x + \frac{x^3}{3} + \frac{x^5}{6}$

2) $\text{Cosh}(x + iy) =$ _____

a) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$ b) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$
c) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$ d) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$

3) The value of $\lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ is _____

a) $\frac{1}{6}$ b) $-\frac{1}{6}$ c) 0 d) $\frac{1}{3}$

4) If the characteristic equation of a matrix A is $\lambda^2 - 2\lambda + 1 = 0$ then

a) $A^{-1} = A - 2I$ b) $A^{-1} = 2I - A$
c) $A^{-1} = A^2 - 2A$ d) A^{-1} does not exist

5) The rank of the matrix $\begin{bmatrix} 2 & 2 & 2 \\ 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$ is

a) 1 b) 2 c) 3 d) 0



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e) If $\sin(\theta + i\phi) = P(\cos \alpha + i \sin \alpha)$ then prove that $P^2 = \frac{1}{2}(\cosh 2\phi - \cos 2\theta)$. 3

4. Attempt **any two** of the following :

a) If $y = \left(x + \sqrt{x^2 + a^2}\right)^m$ then prove that
 $(x^2 + a^2) y_{n+2} + (2n + 1) xy_{n+1} + (n^2 - m^2) y_n = 0$ and hence prove that
 $a^2 \cdot y_{n+2}(0) = (m^2 - n^2)y_n(0)$. 5

b) Expand $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ in powers of x. 5

c) If $\cos(x + iy) = \cos \alpha + i \sin \alpha$ then prove that : 5

i) $y = \frac{1}{2} \log \left[\frac{\sin(x - \alpha)}{\sin(x + \alpha)} \right]$

ii) $\cos 2x + \cosh 2y = 2$.

SECTION – II

5. Solve **any three** : 9

a) Reduce the matrix A to its normal form when $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ hence

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a) If $u = x^2 + y^2 + z^2$, $x = e^t$, $y = e^t \sin t$, $z = e^t \cos t$ find $\frac{du}{dt}$ in terms of t .

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c) If $f(x, y, z) = x^3 y^2 z^4$ find approximate value of f when $x = 1.99$, $y = 3.01$, $z = 0.99$.

d) Find the eigen values and eigen vector corresponding to largest eigen value

of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

e) If $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$, find eigen values of A and A^2 .

7. Solve **any two** :

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a) If $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/6} + y^{1/6}} \right]$, find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$.

b) Examine whether the following vectors are linearly independent or dependent. If dependent find the relation between them $[1, 0, 2, 1]$, $[3, 1, 2, 1]$, $[4, 6, 2, 4]$, $[-6, 0, -3, 0]$.

c) Find the extreme values of $\sin x + \sin y + \sin(x + y)$.



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Marks : 14

1. Choose the correct answer :

14

- 1) Let A be 3×3 matrix of rank 3 then the solution of $A X = 0$ is
- a) No solution
 - b) One independent parameter
 - c) Three independent parameter
 - d) A trivial solution

2) If $z = \log(x \tan^{-1} y)$ then $\frac{\partial^2 z}{\partial x \partial y} =$ _____

- a) $\frac{x}{1+y^2}$
- b) $\frac{1}{x}$
- c) $\frac{1}{x(1+y^2)}$
- d) 0

3) If $u = \frac{\sqrt{x^3 + y^3}}{x + y}$ then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$ _____

- a) $\frac{3u}{2}$
- b) $\frac{u}{2}$
- c) 0
- d) $2u$

4) If $u = x - y$, $v = xy$, then $\frac{\partial(u, v)}{\partial(x, y)} =$ _____

- a) $x - y$
- b) $y - x$
- c) 0
- d) $x + y$

- 5) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to _____

- a) 1%
- b) 3%
- c) 2%
- d) 0%



6) If $y = \sin^2 x$ then $y_n =$ _____

- a) $-2^{n-1} \cdot \cos\left(2x + n\frac{\pi}{2}\right)$ b) $2^{n-1} \cdot \cos\left(2x - n\frac{\pi}{2}\right)$
 c) $2^{n-1} \cdot \sin\left(2x + n\frac{\pi}{2}\right)$ d) $2^{n+1} \sin\left(2x - n\frac{\pi}{2}\right)$

7) If $a + ib = \frac{1}{2 + 2i}$ then $a^2 + b^2 =$ _____

- a) 8 b) $\frac{1}{8}$ c) 4 d) $\frac{1}{4}$

8) The principal value of $\log(i) =$ _____

- a) 0 b) $i\pi$ c) $2\pi i$ d) $i\frac{\pi}{2}$

9) If $y = \frac{1}{(x+3)^3}$ then $y_n =$ _____

- a) $\frac{(-1)^n \cdot (n+2)!}{(x+3)^{n+2}}$ b) $\frac{(-1)^n \cdot (n+1)!}{(x+3)^{n+3}}$ c) $\frac{(-1)^{n-1} \cdot (n+1)!}{(x+3)^{n+3}}$ d) $\frac{(-1)^n \cdot n!}{(x+3)^{n+1}} \cdot 3^n$

10) The first three terms in expansion of $e^x \cdot \tan x$ are _____

- a) $x + \frac{x^2}{2} + \frac{x^3}{3}$ b) $x + \frac{x^3}{3} + \frac{2}{5}x^5$ c) $x + x^2 + \frac{5}{6}x^3$ d) $x + \frac{x^3}{3} + \frac{x^5}{6}$

11) $\text{Cosh}(x + iy) =$ _____

- a) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$ b) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$
 c) $\cosh x \cdot \cosh y - i \sinh x \cdot \sinh y$ d) $\cosh x \cdot \cosh y + i \sinh x \cdot \sinh y$

12) The value of $\lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ is _____

- a) $\frac{1}{6}$ b) $-\frac{1}{6}$ c) 0 d) $\frac{1}{3}$

13) If the characteristic equation of a matrix A is $\lambda^2 - 2\lambda + 1 = 0$ then

- a) $A^{-1} = A - 2I$ b) $A^{-1} = 2I - A$
 c) $A^{-1} = A^2 - 2A$ d) A^{-1} does not exist

14) The rank of the matrix $\begin{bmatrix} 2 & 2 & 2 \\ 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$ is _____

- a) 1 b) 2 c) 3 d) 0



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F.E. (Part – I) (New-CBCS) Examination, 2016
ENGINEERING MATHEMATICS – I

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**
3) **Use of non-programmable calculator is allowed.**

SECTION – I

2. Attempt **any three** of the following :

- a) Find n^{th} derivative of $\frac{x^2 + 4x + 1}{x^3 + 2x^2 - x - 2}$. 3
- b) If $y = \sin^2 x \cdot \cos^3 x$ then find y_n . 3
- c) Prove that $\sec^2 x = 1 + x^2 + \frac{2x^4}{3} + \dots$ 3
- d) Expand $f(x) = x^5 - x^4 + x^3 - x^2 + x - 1$ in powers of $(x - 1)$ and hence find $F(0.99)$. 3
- e) Simplify $\left(\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}\right)^{4/3} + \left(\frac{1}{\sqrt{2}} - i\frac{1}{\sqrt{2}}\right)^{4/3}$. 3

3. Attempt **any three** of the following :

- a) Evaluate $\lim_{x \rightarrow 1} (1 + \sec \pi x) \tan\left(\frac{\pi x}{2}\right)$. 3
- b) Evaluate $\lim_{x \rightarrow 1} (1 - x^2)^{\frac{1}{\log(1-x)}}$. 3
- c) Solve $x^5 + 1 = 0$. 3



d) Show that continued product of all values of $\left(\frac{1}{2} - i\frac{\sqrt{3}}{2}\right)^{3/4}$ is 1. 3

e) If $\sin(\theta + i\phi) = P(\cos \alpha + i \sin \alpha)$ then prove that $P^2 = \frac{1}{2}(\cosh 2\phi - \cos 2\theta)$. 3

4. Attempt **any two** of the following :

a) If $y = \left(x + \sqrt{x^2 + a^2}\right)^m$ then prove that
 $(x^2 + a^2) y_{n+2} + (2n + 1) xy_{n+1} + (n^2 - m^2) y_n = 0$ and hence prove that
 $a^2 \cdot y_{n+2}(0) = (m^2 - n^2)y_n(0)$. 5

b) Expand $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ in powers of x . 5

c) If $\cos(x + iy) = \cos \alpha + i \sin \alpha$ then prove that : 5

i) $y = \frac{1}{2} \log \left[\frac{\sin(x - \alpha)}{\sin(x + \alpha)} \right]$

ii) $\cos 2x + \cosh 2y = 2$.

SECTION – II

5. Solve **any three** : 9

a) Reduce the matrix A to its normal form when $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ hence

find the rank of A.

b) Test for consistency and solve the following systems of equations
 $2x - y + 3z = 8$, $-x + 2y + z = 4$, $3x + y - 4z = 0$.

c) If $u = e^x (x \cos y - y \sin y)$ prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.



d) If $z = f(u, v)$, $u = \log(x^2 + y^2)$, $v = \frac{y}{x}$ show that $x \frac{\partial z}{\partial y} - y \frac{\partial z}{\partial x} = (1 + v^2) \frac{\partial z}{\partial v}$.

e) Find the maximum value of $f = x^2 y^3 z^4$, subject to the condition $x + y + z = 5$.

6. Solve **any three** :

9

a) If $u = x^2 + y^2 + z^2$, $x = e^t$, $y = e^t \sin t$, $z = e^t \cos t$ find $\frac{du}{dt}$ in terms of t .

b) If $u = x^2 - y^2$, $v = 2xy$ where $x = r \cos \theta$, $y = r \sin \theta$ find $\frac{\partial(u, v)}{\partial(r, \theta)}$.

c) If $f(x, y, z) = x^3 y^2 z^4$ find approximate value of f when $x = 1.99$, $y = 3.01$, $z = 0.99$.

d) Find the eigen values and eigen vector corresponding to largest eigen value

of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

e) If $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$, find eigen values of A and A^2 .

7. Solve **any two** :

10

a) If $u = \text{Sin}^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/6} + y^{1/6}} \right]$, find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$.

b) Examine whether the following vectors are linearly independent or dependent. If dependent find the relation between them $[1, 0, 2, 1]$, $[3, 1, 2, 1]$, $[4, 6, 2, 4]$, $[-6, 0, -3, 0]$.

c) Find the extreme values of $\sin x + \sin y + \sin(x + y)$.



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F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Use of non-programmable scientific calculators is **allowed**.
4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) The process of finding out the resultant of a force system is called
 - a) Composition of forces
 - b) Resolution of forces
 - c) Idealization of forces
 - d) None of these
- 2) When a force is resolved in two mutually perpendicular components, they are ?
 - a) Orthogonal components
 - b) Rectangular components
 - c) Reciprocal components
 - d) None of these
- 3) The angle of inclination of the plane at which the body resting on plane begins to move down the plane is called
 - a) Angle of friction
 - b) Angle of projection
 - c) Angle of repose
 - d) None of these
- 4) A beam, 10 m long, carries uniformly distributed load of 8 KN/m and supported at its two ends. What is the reaction at each support ?
 - a) 8 KN
 - b) 80 KN
 - c) 40 KN
 - d) 4 KN
- 5) The M.I. of a rectangular section of base (b) and height (h) about an axis passing through its base is given by
 - a) $bh^3/12$
 - b) $bh^3/24$
 - c) $bh^3/36$
 - d) $bh^3/3$
- 6) The moment of a force about any point is geometrically equal to _____ the area of the triangle, whose base is line representing the force and vertex is the point about which the moment is taken.
 - a) Half
 - b) Same
 - c) Twice
 - d) None of above



Seat No.	
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F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Use of non-programmable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Solve **any four** : (4×3=12)
- a) State the laws of friction. 3
 - b) Explain various types of supports for beams. 3
 - c) State the assumptions made in the analysis of perfect frame. 3
 - d) State and prove 'Law of Parallelogram of forces', for calculating the resultant force. 3
 - e) Forces acting along sides and at apices of an equilateral triangle of side 5 m are as shown in figure (1). A clockwise moment of 150 N-m acts about point C. Determine only the magnitude of the resultant of the force system. 3

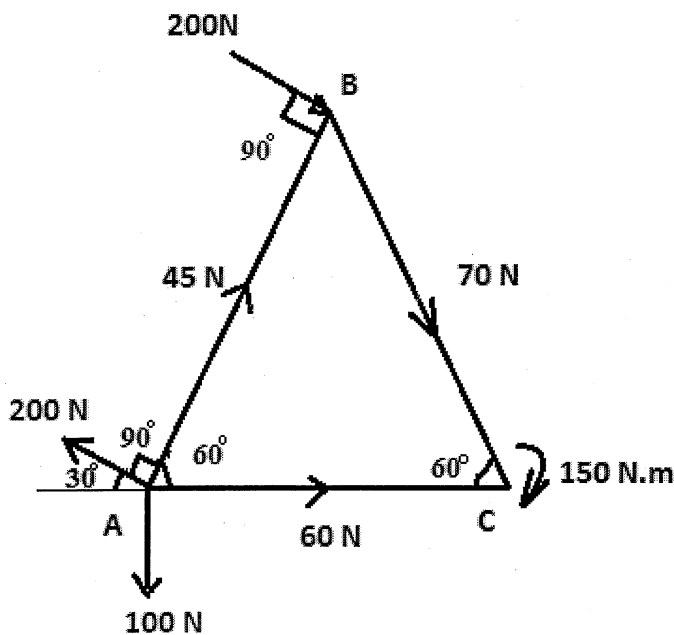


Fig. (1)

Set P



f) Find the reaction at support B only, for the beam, loaded as shown in figure (2). 3

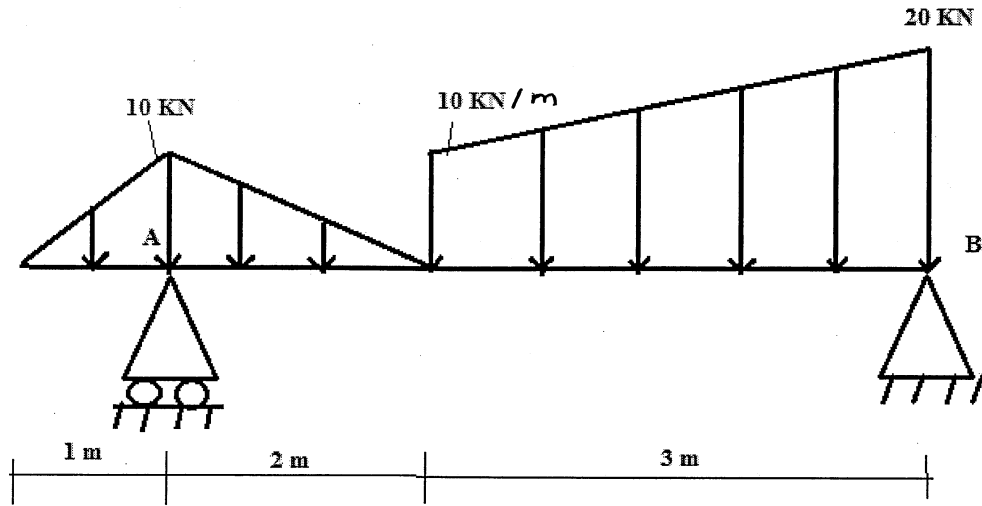


Fig. (2)

g) Locate centroid of the shaded area of a plane lamina, as shown in figure (3). 3

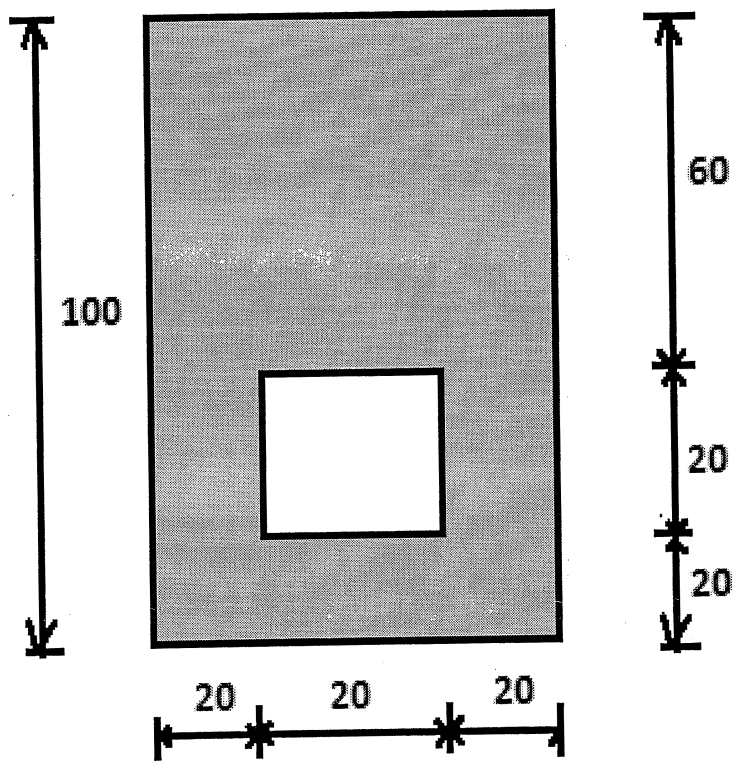


Fig. (3)



3. Solve **any two** questions of the following : (8×2=16)

- a) Two cylinders of 200 mm diameter each and weight 100 N each, rest in a horizontal channel having vertical walls. The distance between the walls is 360 mm. Find the reactions at the points of contact A, B, C and D as shown in Figure 4. Assume all surfaces to be smooth. 8

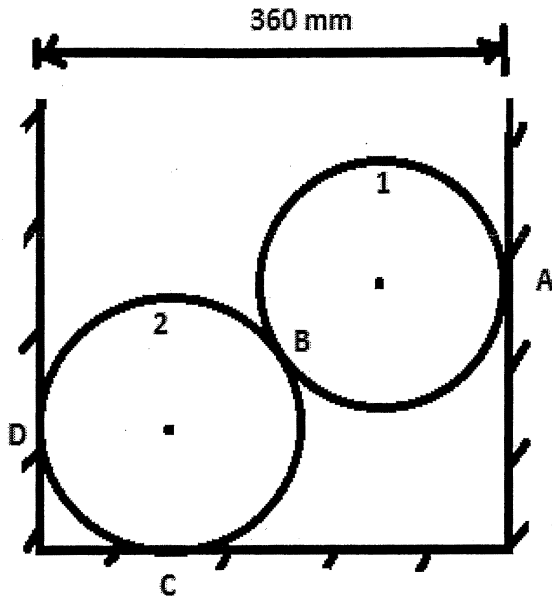


Fig. (4)

- b) Determine the forces in members AB, BC, BD, BE, DE of the truss as shown in Fig. (5). 8

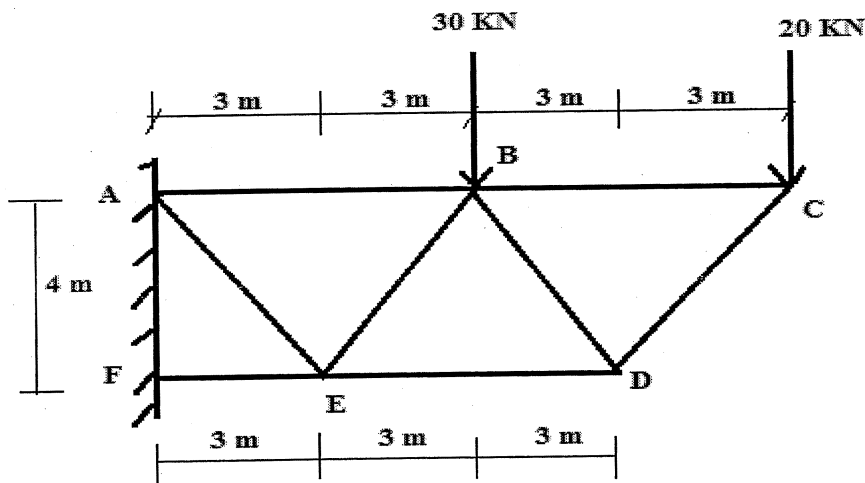


Fig. (5)



- c) Locate the centroid of shaded area shown in figure (6). Determine the M.I. of the shaded area about the centroidal X-X axis only. Also find M.I. of the shaded area about the base A-B. All dimensions are in 'mm'.

8

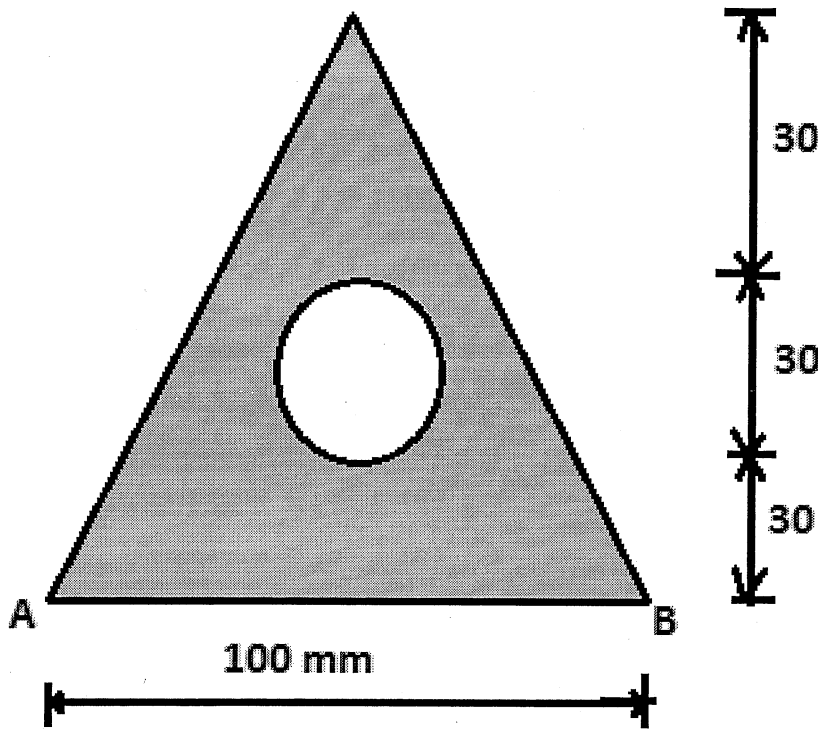


Fig. (6)

SECTION – II

4. Solve **any four** of the following : (4×3=12)
- A particle, starting from rest moves in a straight line, whose equation of motion is given by $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds. 3
 - Derive x-t, v-t and a-t relationships for uniformly accelerated motion. 3
 - A car of 2 ton mass moving at speed 54 kmph is to be brought to halt in a distance of 40 m. What should be the braking force applied assuming it to be uniform ? 3
 - What do you understand by 'Super-elevation' ? Discuss necessity of providing super elevation on railways. 3

Set P



- e) A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find the average torque exerted on it, if the radius of gyration of the flywheel is 60 cm. 3
- f) State and prove the 'Work Energy Principle'. 3

5. Solve **any two** of the following : (8×2=16)

- a) A ball is thrown from top of a building of 20 m height with a velocity of 30 m/sec at an upward angle 45 degrees to the horizontal. Determine the velocity of ball at $t = 2$ seconds. How high the ball will rise above the ground ? Determine the horizontal distance it will travel before striking the ground. Also, determine the velocity and direction of ball at the instant of striking the ground. 8
- b) Two rough planes inclined at 30° and 15° to the horizontal and of the same height, are placed back to back. Two bodies of masses 15 kg and 5 kg are placed on the faces and connected by a string over top of planes and frictionless pulley. Assuming coefficient of friction to be 0.3, find the resulting acceleration of the system (Refer Fig. 7). 8

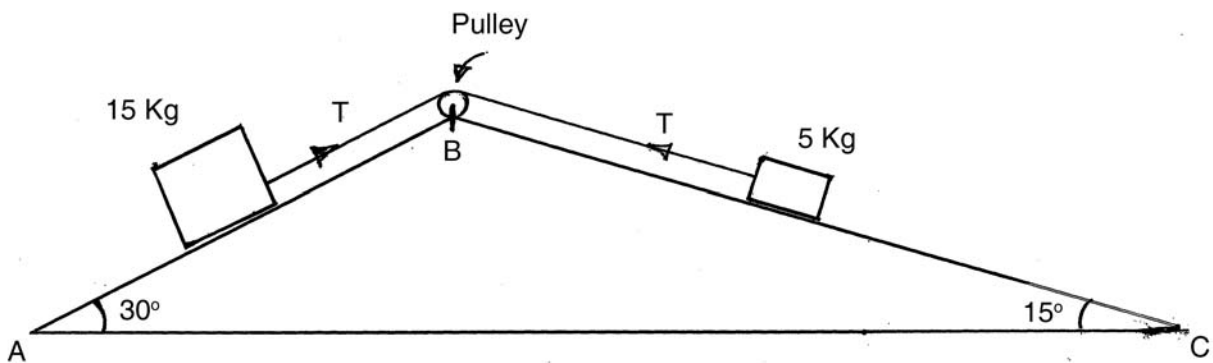


Fig. (7) with question 5(b)

- c) A truck of mass 6 ton moving at 60 kmph collides with a car of 2 ton mass moving at 45 kmph in the same direction as that of truck. If after the collision, they join and move together as one body, determine their common velocity. Determine the loss in kinetic energy, considering the two vehicles to be single system. 8



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**F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Use of non-programmable scientific calculators is **allowed**.
4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) The position of a particle which moves along a straight line by the relation $x = t^3 - 6t^2 - 15t + 40$. Find the time at which velocity is zero ?
a) 0 b) 5 sec c) 10 sec d) 15 sec
- 2) A particle is dropped from a height h above the ground. Assuming negligible air resistance, the velocity with which it will strike the ground is
a) $2gh$ b) $\sqrt{2gh}$ c) $\sqrt{2gh^2}$ d) $2\sqrt{gh}$
- 3) A stone just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following
a) Straight line b) Parabolic path
c) Hyperbolic path d) Circular path
- 4) The law of motion involved in the recoil of gun is
a) Newton's first law of motion b) Newton's second law of motion
c) Newton's third law of motion d) None of these
- 5) When a elevator of weight W moving upward with uniform acceleration, then the tension in the cable supported the lift is
a) $T = m(g + a)$ b) $T = m(g - a)$
c) $T = mg$ d) None of the above
- 6) During elastic impact, the relative velocity of two bodies after impacts is _____ the relative velocity of the two bodies before impact.
a) Equal to b) Equal and opposite to
c) Less than d) Greater than

P.T.O.



- 7) The work done on a body is zero when, _____
- There is no displacement of the body
 - Resultant of forces acting on it is zero
 - The displacement is perpendicular to the direction of force
 - All of above
- 8) The process of finding out the resultant of a force system is called
- Composition of forces
 - Resolution of forces
 - Idealization of forces
 - None of these
- 9) When a force is resolved in two mutually perpendicular components, they are ?
- Orthogonal components
 - Rectangular components
 - Reciprocal components
 - None of these
- 10) The angle of inclination of the plane at which the body resting on plane begins to move down the plane is called
- Angle of friction
 - Angle of projection
 - Angle of repose
 - None of these
- 11) A beam, 10 m long, carries uniformly distributed load of 8 KN/m and supported at its two ends. What is the reaction at each support ?
- 8 KN
 - 80 KN
 - 40 KN
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- 12) The M.I. of a rectangular section of base (b) and height (h) about an axis passing through its base is given by
- $bh^3/12$
 - $bh^3/24$
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- 13) The moment of a force about any point is geometrically equal to _____ the area of the triangle, whose base is line representing the force and vertex is the point about which the moment is taken.
- Half
 - Same
 - Twice
 - None of above
- 14) A framed structure is imperfect, if the number of members are _____ $(2j - 3)$, where 'j' is number of joints of a frame.
- Equal to
 - Less than
 - Greater than
 - Either b or c
-



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F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Use of non-programmable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Solve **any four** : (4×3=12)
- a) State the laws of friction. 3
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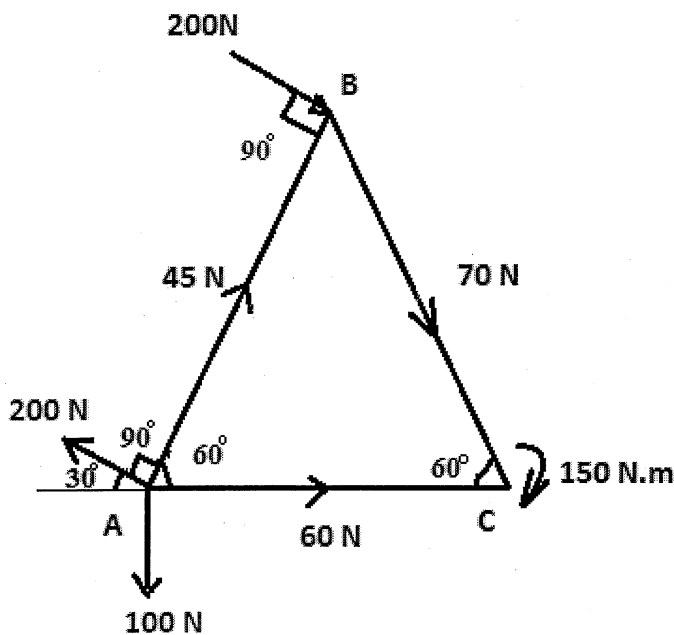


Fig. (1)

Set Q



f) Find the reaction at support B only, for the beam, loaded as shown in figure (2). 3

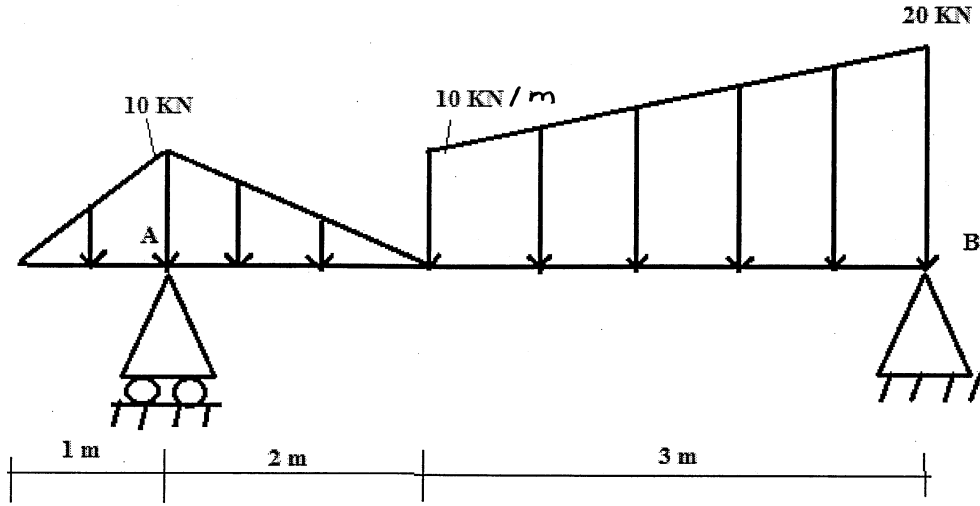


Fig. (2)

g) Locate centroid of the shaded area of a plane lamina, as shown in figure (3). 3

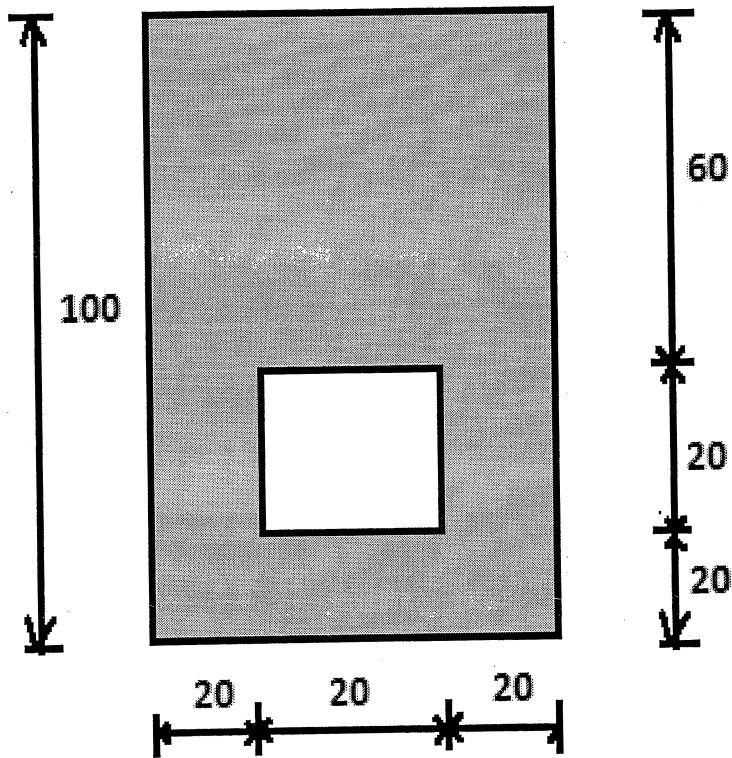


Fig. (3)



3. Solve **any two** questions of the following : (8×2=16)

- a) Two cylinders of 200 mm diameter each and weight 100 N each, rest in a horizontal channel having vertical walls. The distance between the walls is 360 mm. Find the reactions at the points of contact A, B, C and D as shown in Figure 4. Assume all surfaces to be smooth. 8

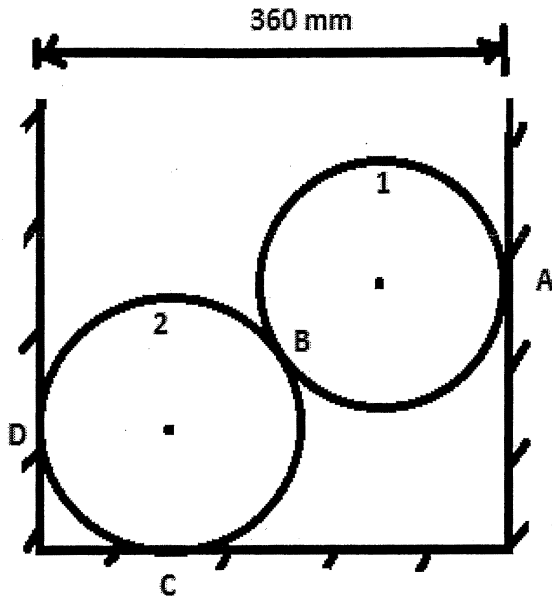


Fig. (4)

- b) Determine the forces in members AB, BC, BD, BE, DE of the truss as shown in Fig. (5). 8

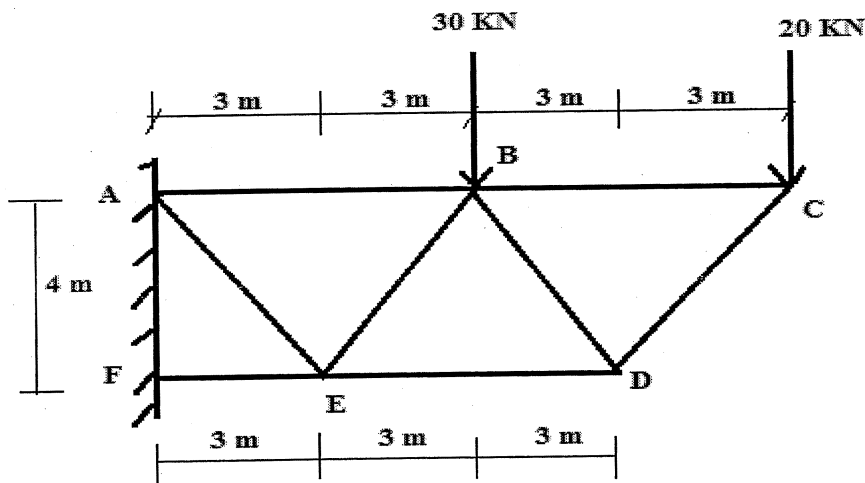


Fig. (5)



- c) Locate the centroid of shaded area shown in figure (6). Determine the M.I. of the shaded area about the centroidal X-X axis only. Also find M.I. of the shaded area about the base A-B. All dimensions are in 'mm'.

8

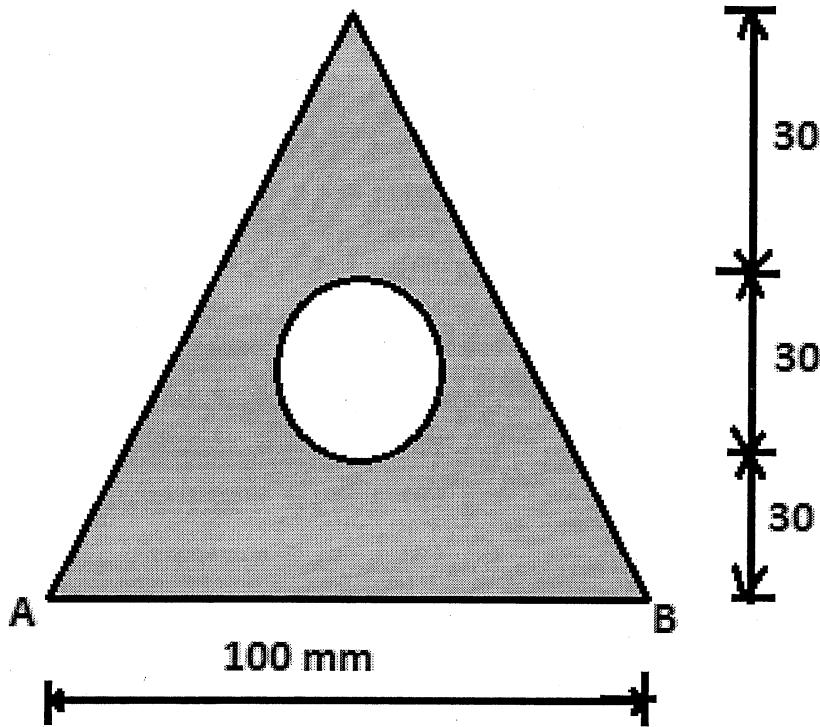


Fig. (6)

SECTION – II

4. Solve **any four** of the following : (4×3=12)
- A particle, starting from rest moves in a straight line, whose equation of motion is given by $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds. 3
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 - What do you understand by 'Super-elevation' ? Discuss necessity of providing super elevation on railways. 3

Set Q



- e) A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find the average torque exerted on it, if the radius of gyration of the flywheel is 60 cm. 3
- f) State and prove the 'Work Energy Principle'. 3

5. Solve **any two** of the following : (8×2=16)

- a) A ball is thrown from top of a building of 20 m height with a velocity of 30 m/sec at an upward angle 45 degrees to the horizontal. Determine the velocity of ball at $t = 2$ seconds. How high the ball will rise above the ground ? Determine the horizontal distance it will travel before striking the ground. Also, determine the velocity and direction of ball at the instant of striking the ground. 8
- b) Two rough planes inclined at 30° and 15° to the horizontal and of the same height, are placed back to back. Two bodies of masses 15 kg and 5 kg are placed on the faces and connected by a string over top of planes and frictionless pulley. Assuming coefficient of friction to be 0.3, find the resulting acceleration of the system (Refer Fig. 7). 8

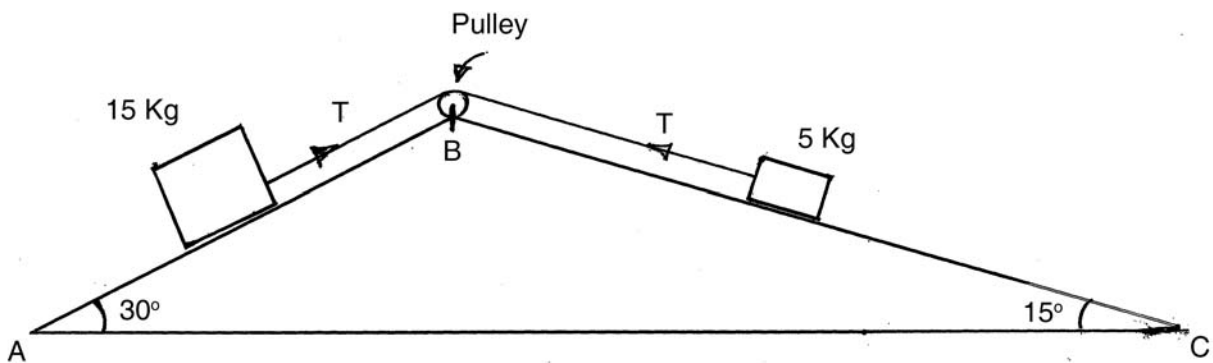


Fig. (7) with question 5(b)

- c) A truck of mass 6 ton moving at 60 kmph collides with a car of 2 ton mass moving at 45 kmph in the same direction as that of truck. If after the collision, they join and move together as one body, determine their common velocity. Determine the loss in kinetic energy, considering the two vehicles to be single system. 8



SLR-EP – 2

Seat No.	
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**F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Use of non-programmable scientific calculators is **allowed**.
4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**

- 1) The M.I. of a rectangular section of base (b) and height (h) about an axis passing through its base is given by
a) $bh^3/12$ b) $bh^3/24$ c) $bh^3/36$ d) $bh^3/3$
- 2) The moment of a force about any point is geometrically equal to _____ the area of the triangle, whose base is line representing the force and vertex is the point about which the moment is taken.
a) Half b) Same c) Twice d) None of above
- 3) A framed structure is imperfect, if the number of members are _____ $(2j - 3)$, where 'j' is number of joints of a frame.
a) Equal to b) Less than
c) Greater than d) Either b or c
- 4) The position of a particle which moves along a straight line by the relation $x = t^3 - 6t^2 - 15t + 40$. Find the time at which velocity is zero ?
a) 0 b) 5 sec c) 10 sec d) 15 sec
- 5) A particle is dropped from a height h above the ground. Assuming negligible air resistance, the velocity with which it will strikes the ground is
a) $2gh$ b) $\sqrt{2gh}$ c) $\sqrt{2gh^2}$ d) $2\sqrt{gh}$
- 6) A stone just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following
a) Straight line b) Parabolic path
c) Hyperbolic path d) Circular path

P.T.O.



- 7) The law of motion involved in the recoil of gun is
- a) Newton's first law of motion b) Newton's second law of motion
c) Newton's third law of motion d) None of these
- 8) When a elevator of weight W moving upward with uniform acceleration, then the tension in the cable supported the lift is
- a) $T = m(g + a)$ b) $T = m(g - a)$
c) $T = mg$ d) None of the above
- 9) During elastic impact, the relative velocity of two bodies after impacts is _____ the relative velocity of the two bodies before impact.
- a) Equal to b) Equal and opposite to
c) Less than d) Greater than
- 10) The work done on a body is zero when, _____
- a) There is no displacement of the body
b) Resultant of forces acting on it is zero
c) The displacement is perpendicular to the direction of force
d) All of above
- 11) The process of finding out the resultant of a force system is called
- a) Composition of forces b) Resolution of forces
c) Idealization of forces d) None of these
- 12) When a force is resolved in two mutually perpendicular components, they are ?
- a) Orthogonal components b) Rectangular components
c) Reciprocal components d) None of these
- 13) The angle of inclination of the plane at which the body resting on plane begins to move down the plane is called
- a) Angle of friction b) Angle of projection
c) Angle of repose d) None of these
- 14) A beam, 10 m long, carries uniformly distributed load of 8 kN/m and supported at its two ends. What is the reaction at each support ?
- a) 8 kN b) 80 kN c) 40 kN d) 4 kN
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Seat No.	
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F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Use of non-programmable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Solve **any four** : (4×3=12)
- a) State the laws of friction. 3
 - b) Explain various types of supports for beams. 3
 - c) State the assumptions made in the analysis of perfect frame. 3
 - d) State and prove 'Law of Parallelogram of forces', for calculating the resultant force. 3
 - e) Forces acting along sides and at apices of an equilateral triangle of side 5 m are as shown in figure (1). A clockwise moment of 150 N-m acts about point C. Determine only the magnitude of the resultant of the force system. 3

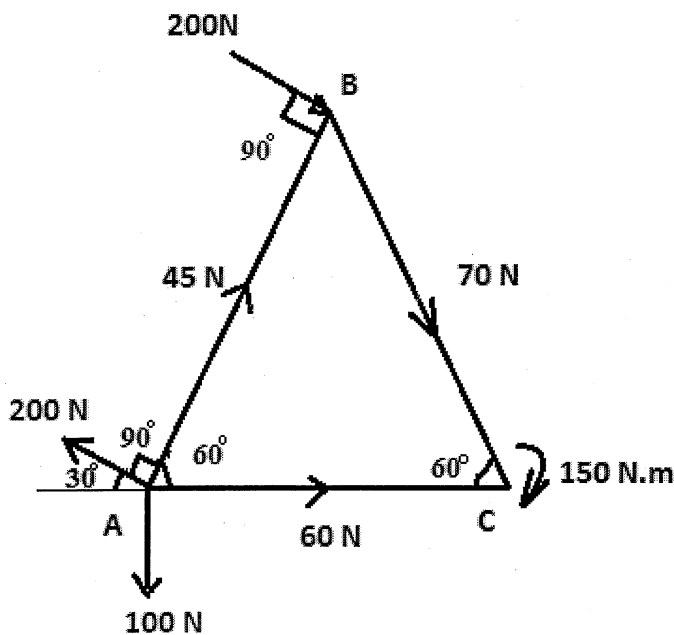


Fig. (1)

Set R



f) Find the reaction at support B only, for the beam, loaded as shown in figure (2). 3

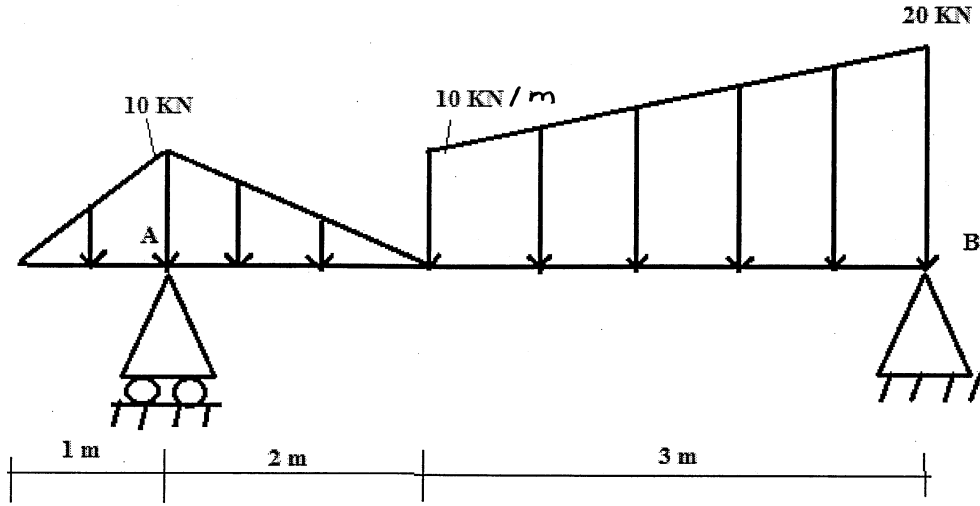


Fig. (2)

g) Locate centroid of the shaded area of a plane lamina, as shown in figure (3). 3

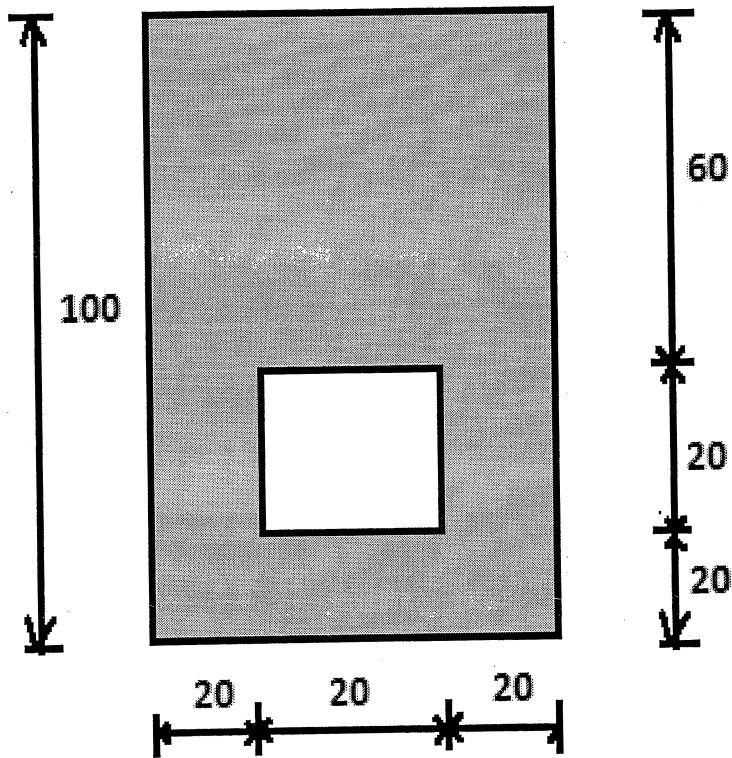


Fig. (3)



3. Solve **any two** questions of the following : (8×2=16)

- a) Two cylinders of 200 mm diameter each and weight 100 N each, rest in a horizontal channel having vertical walls. The distance between the walls is 360 mm. Find the reactions at the points of contact A, B, C and D as shown in Figure 4. Assume all surfaces to be smooth. 8

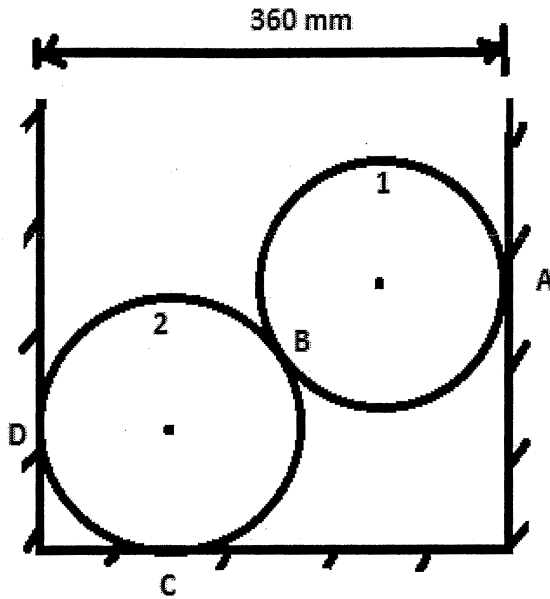


Fig. (4)

- b) Determine the forces in members AB, BC, BD, BE, DE of the truss as shown in Fig. (5). 8

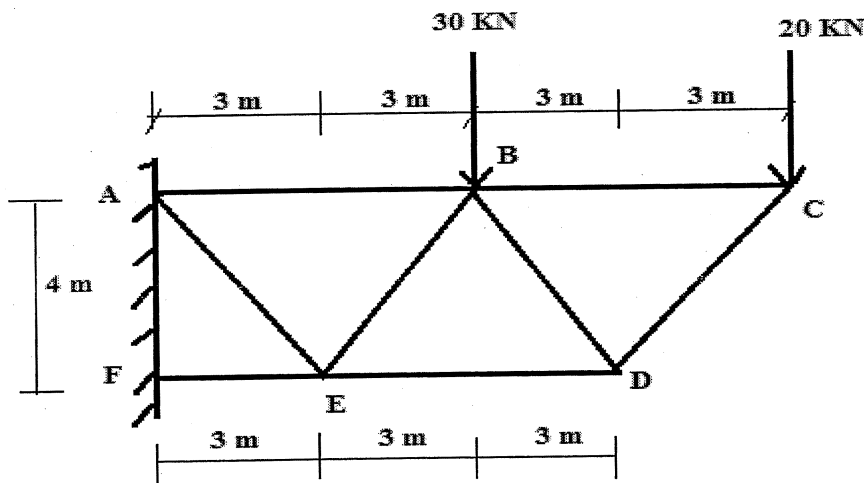


Fig. (5)



- c) Locate the centroid of shaded area shown in figure (6). Determine the M.I. of the shaded area about the centroidal X-X axis only. Also find M.I. of the shaded area about the base A-B. All dimensions are in 'mm'.

8

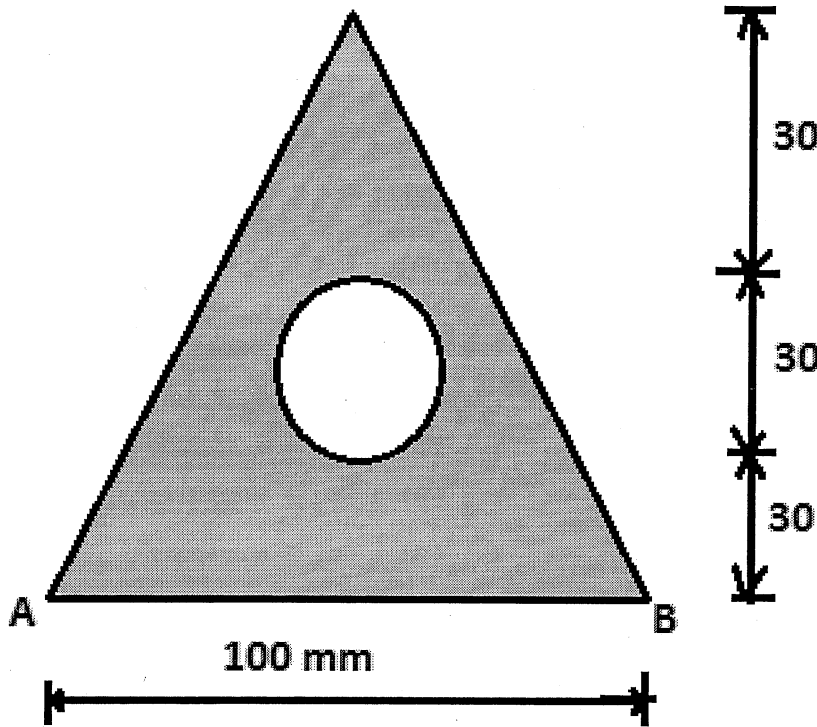


Fig. (6)

SECTION – II

4. Solve **any four** of the following : (4×3=12)
- A particle, starting from rest moves in a straight line, whose equation of motion is given by $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds. 3
 - Derive x-t, v-t and a-t relationships for uniformly accelerated motion. 3
 - A car of 2 ton mass moving at speed 54 kmph is to be brought to halt in a distance of 40 m. What should be the braking force applied assuming it to be uniform ? 3
 - What do you understand by 'Super-elevation' ? Discuss necessity of providing super elevation on railways. 3

Set R



- e) A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find the average torque exerted on it, if the radius of gyration of the flywheel is 60 cm. 3
- f) State and prove the 'Work Energy Principle'. 3

5. Solve **any two** of the following : (8×2=16)

- a) A ball is thrown from top of a building of 20 m height with a velocity of 30 m/sec at an upward angle 45 degrees to the horizontal. Determine the velocity of ball at $t = 2$ seconds. How high the ball will rise above the ground ? Determine the horizontal distance it will travel before striking the ground. Also, determine the velocity and direction of ball at the instant of striking the ground. 8
- b) Two rough planes inclined at 30° and 15° to the horizontal and of the same height, are placed back to back. Two bodies of masses 15 kg and 5 kg are placed on the faces and connected by a string over top of planes and frictionless pulley. Assuming coefficient of friction to be 0.3, find the resulting acceleration of the system (Refer Fig. 7). 8

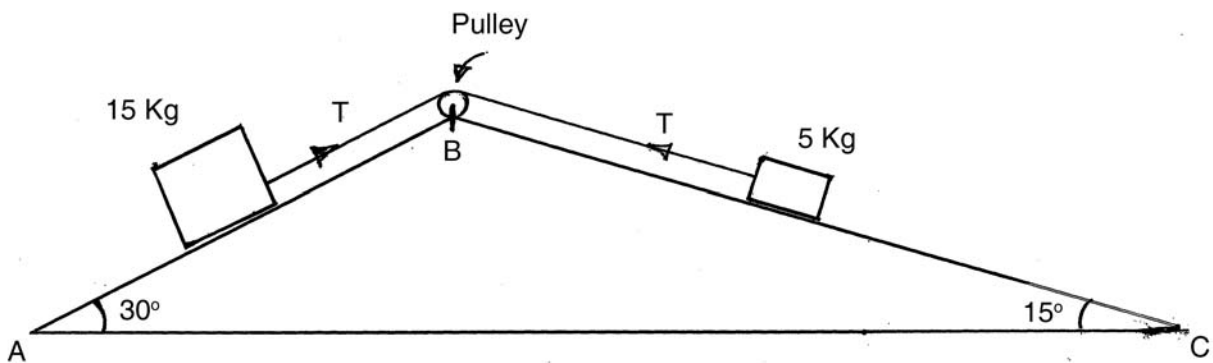


Fig. (7) with question 5(b)

- c) A truck of mass 6 ton moving at 60 kmph collides with a car of 2 ton mass moving at 45 kmph in the same direction as that of truck. If after the collision, they join and move together as one body, determine their common velocity. Determine the loss in kinetic energy, considering the two vehicles to be single system. 8



SLR-EP – 2

Seat No.	
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**F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Use of non-programmable scientific calculators is **allowed**.
4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**
- 1) A stone just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following
 - a) Straight line
 - b) Parabolic path
 - c) Hyperbolic path
 - d) Circular path
 - 2) The law of motion involved in the recoil of gun is
 - a) Newton's first law of motion
 - b) Newton's second law of motion
 - c) Newton's third law of motion
 - d) None of these
 - 3) When a elevator of weight W moving upward with uniform acceleration, then the tension in the cable supported the lift is
 - a) $T = m(g + a)$
 - b) $T = m(g - a)$
 - c) $T = mg$
 - d) None of the above
 - 4) During elastic impact, the relative velocity of two bodies after impacts is _____ the relative velocity of the two bodies before impact.
 - a) Equal to
 - b) Equal and opposite to
 - c) Less than
 - d) Greater than
 - 5) The work done on a body is zero when, _____
 - a) There is no displacement of the body
 - b) Resultant of forces acting on it is zero
 - c) The displacement is perpendicular to the direction of force
 - d) All of above

P.T.O.



- 6) The process of finding out the resultant of a force system is called
- a) Composition of forces b) Resolution of forces
c) Idealization of forces d) None of these
- 7) When a force is resolved in two mutually perpendicular components, they are ?
- a) Orthogonal components b) Rectangular components
c) Reciprocal components d) None of these
- 8) The angle of inclination of the plane at which the body resting on plane begins to move down the plane is called
- a) Angle of friction b) Angle of projection
c) Angle of repose d) None of these
- 9) A beam, 10 m long, carries uniformly distributed load of 8 KN/m and supported at its two ends. What is the reaction at each support ?
- a) 8 KN b) 80 KN c) 40 KN d) 4 KN
- 10) The M.I. of a rectangular section of base (b) and height (h) about an axis passing through its base is given by
- a) $bh^3/12$ b) $bh^3/24$ c) $bh^3/36$ d) $bh^3/3$
- 11) The moment of a force about any point is geometrically equal to _____ the area of the triangle, whose base is line representing the force and vertex is the point about which the moment is taken.
- a) Half b) Same c) Twice d) None of above
- 12) A framed structure is imperfect, if the number of members are _____ $(2j - 3)$, where 'j' is number of joints of a frame.
- a) Equal to b) Less than
c) Greater than d) Either b or c
- 13) The position of a particle which moves along a straight line by the relation $x = t^3 - 6t^2 - 15t + 40$. Find the time at which velocity is zero ?
- a) 0 b) 5 sec c) 10 sec d) 15 sec
- 14) A particle is dropped from a height h above the ground. Assuming negligible air resistance, the velocity with which it will strikes the ground is
- a) $2gh$ b) $\sqrt{2gh}$ c) $\sqrt{2gh^2}$ d) $2\sqrt{gh}$
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Seat No.	
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F.E. (Part – I) (New – CBCS) Examination, 2016
APPLIED MECHANICS

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Use of non-programmable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Solve **any four** : (4×3=12)
- a) State the laws of friction. 3
 - b) Explain various types of supports for beams. 3
 - c) State the assumptions made in the analysis of perfect frame. 3
 - d) State and prove 'Law of Parallelogram of forces', for calculating the resultant force. 3
 - e) Forces acting along sides and at apices of an equilateral triangle of side 5 m are as shown in figure (1). A clockwise moment of 150 N-m acts about point C. Determine only the magnitude of the resultant of the force system. 3

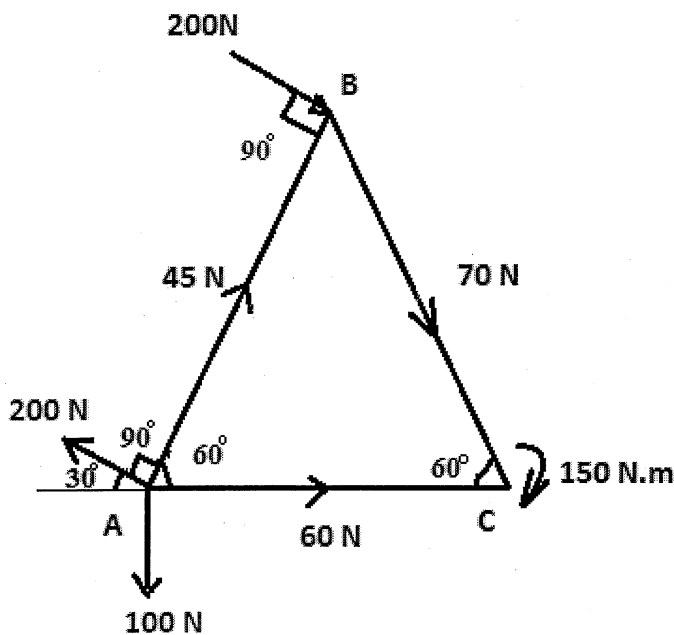


Fig. (1)

Set S



f) Find the reaction at support B only, for the beam, loaded as shown in figure (2). 3

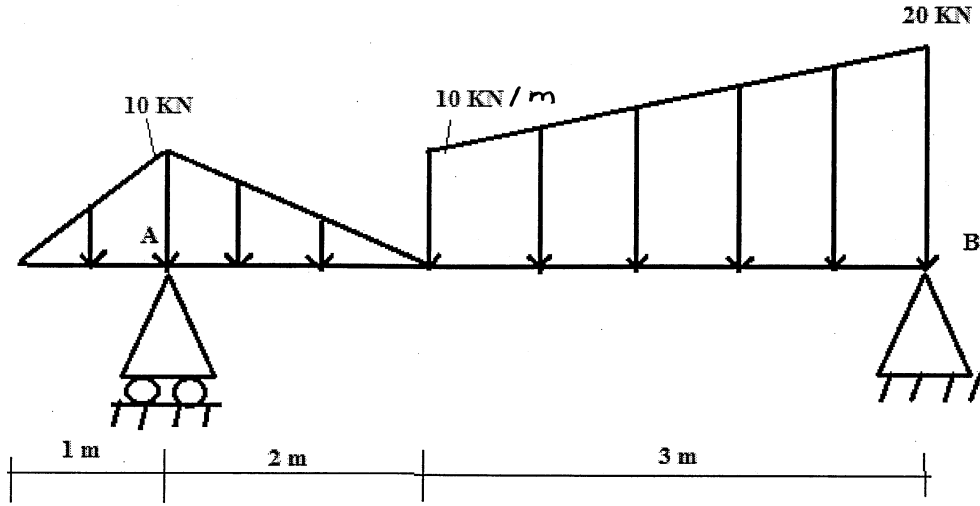


Fig. (2)

g) Locate centroid of the shaded area of a plane lamina, as shown in figure (3). 3

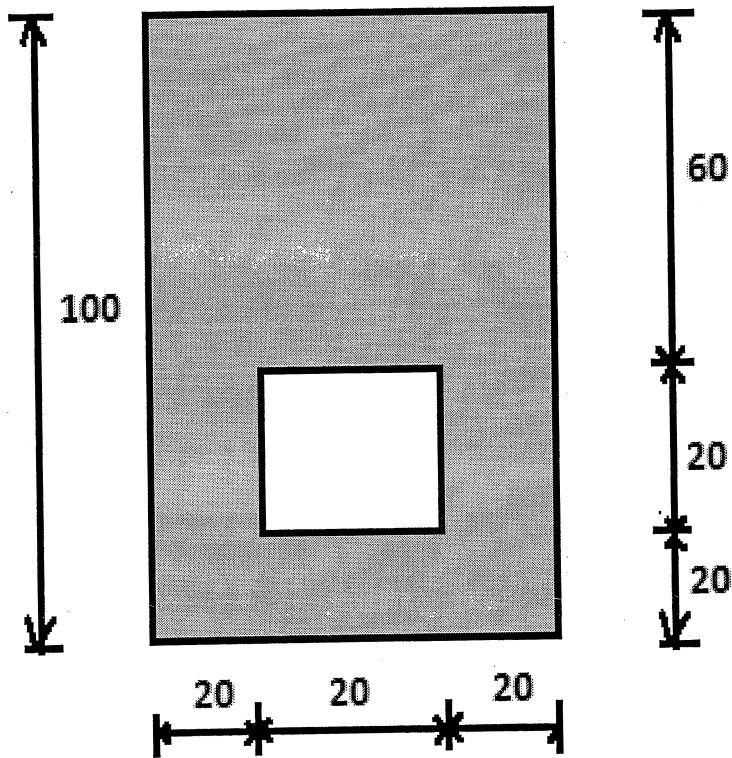


Fig. (3)



3. Solve **any two** questions of the following : (8×2=16)

- a) Two cylinders of 200 mm diameter each and weight 100 N each, rest in a horizontal channel having vertical walls. The distance between the walls is 360 mm. Find the reactions at the points of contact A, B, C and D as shown in Figure 4. Assume all surfaces to be smooth. 8

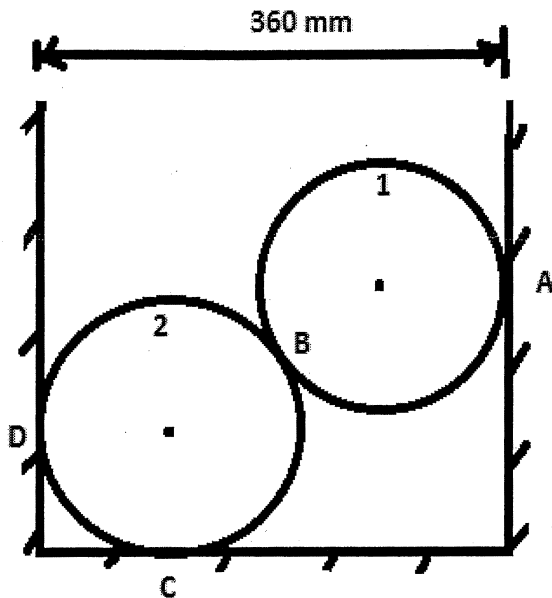


Fig. (4)

- b) Determine the forces in members AB, BC, BD, BE, DE of the truss as shown in Fig. (5). 8

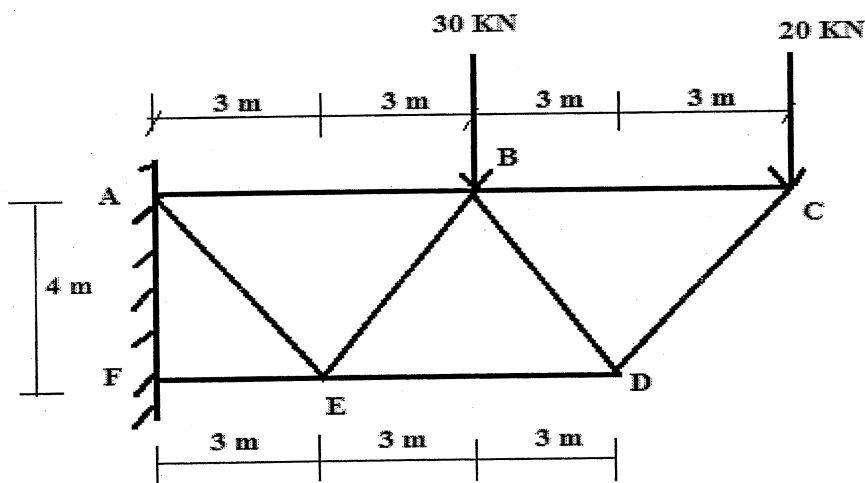


Fig. (5)



- c) Locate the centroid of shaded area shown in figure (6). Determine the M.I. of the shaded area about the centroidal X-X axis only. Also find M.I. of the shaded area about the base A-B. All dimensions are in 'mm'.

8

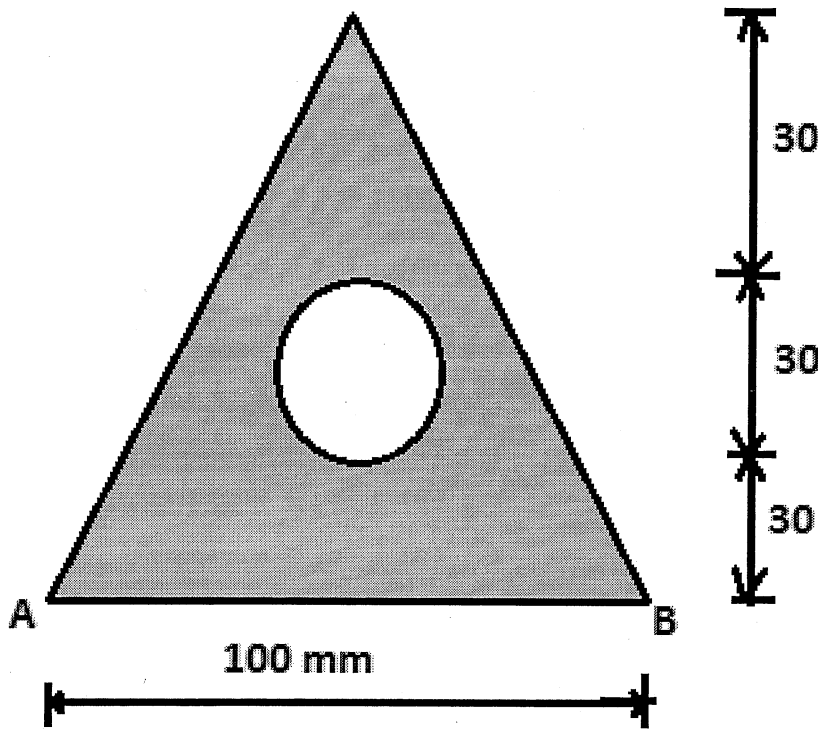


Fig. (6)

SECTION – II

4. Solve **any four** of the following : (4×3=12)
- A particle, starting from rest moves in a straight line, whose equation of motion is given by $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds. 3
 - Derive x-t, v-t and a-t relationships for uniformly accelerated motion. 3
 - A car of 2 ton mass moving at speed 54 kmph is to be brought to halt in a distance of 40 m. What should be the braking force applied assuming it to be uniform ? 3
 - What do you understand by 'Super-elevation' ? Discuss necessity of providing super elevation on railways. 3

Set S



- e) A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find the average torque exerted on it, if the radius of gyration of the flywheel is 60 cm. 3
- f) State and prove the 'Work Energy Principle'. 3

5. Solve **any two** of the following : (8×2=16)

- a) A ball is thrown from top of a building of 20 m height with a velocity of 30 m/sec at an upward angle 45 degrees to the horizontal. Determine the velocity of ball at $t = 2$ seconds. How high the ball will rise above the ground ? Determine the horizontal distance it will travel before striking the ground. Also, determine the velocity and direction of ball at the instant of striking the ground. 8
- b) Two rough planes inclined at 30° and 15° to the horizontal and of the same height, are placed back to back. Two bodies of masses 15 kg and 5 kg are placed on the faces and connected by a string over top of planes and frictionless pulley. Assuming coefficient of friction to be 0.3, find the resulting acceleration of the system (Refer Fig. 7). 8

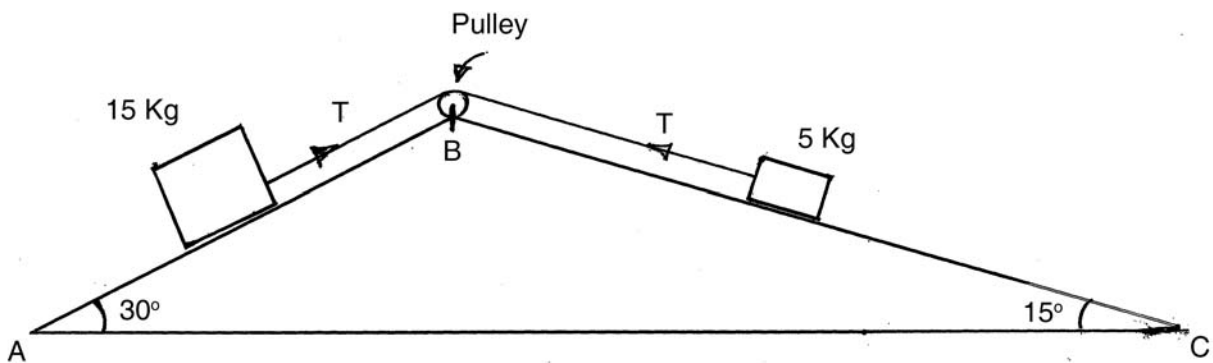


Fig. (7) with question 5(b)

- c) A truck of mass 6 ton moving at 60 kmph collides with a car of 2 ton mass moving at 45 kmph in the same direction as that of truck. If after the collision, they join and move together as one body, determine their common velocity. Determine the loss in kinetic energy, considering the two vehicles to be single system. 8



SLR-EP – 3

Seat No.	
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Set	P
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**F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Figures to the **right** indicates **full** marks.
2) **Assume** suitable data **whenever** necessary.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only.**
Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) A 3 phase supply system is symmetrical if all the three phases have the equal
a) Current b) Voltages c) Impedance d) Power factor
 - 2) The impedance of purely capacitive circuit is given by
a) $z = R - jX_C$ b) $z = + jX_C$ c) $z = - jX_C$ d) $z = X_C + jR$
 - 3) The real part of an admittance $Y = 0.1 + j 0.2$ is
a) Resistance b) Conductance
c) Inductance d) None of the above
 - 4) In single phase steps up transformer
a) $N_1 < N_2$ b) $N_2 < N_1$ c) $V_2 < V_1$ d) $I_1 < I_2$
 - 5) For R-L-C series circuit if $X_L = X_C$ then the expression for the power is, Apparent Power =
a) $P + jQ$ b) $P - jQ$ c) P d) Q
 - 6) Energy of 1000 Wh is equivalent to
a) One unit of energy consumption
b) Thousand unit of energy consumption
c) 36×10^6 Joules
d) None of the above

P.T.O.



- 7) The positive peak value of sinusoidal AC current is occurring at an angle
a) 60° b) 45° c) 30° d) 90°
- 8) A phasors are the
a) Vectors rotating the clockwise direction
b) Vectors rotating in anti clockwise direction
c) Non rotating vectors
d) None of these
- 9) The _____ through all the parts of the series magnetic circuit is same.
a) flux b) reluctance c) mmf d) current
- 10) Hysteresis loop is a graph between
a) Flux and Reluctance b) MMF and Reluctance
c) Flux and Absolute permeability d) None of above
- 11) The best suitable magnetic material for construction of transformer core is
a) Silicon steel b) Hard steel
c) Silicon steel sheet laminations d) Hard steel sheet laminations
- 12) In DC shunt motor
a) Armature and field winding are connected in series
b) Armature and field winding are connected in parallel
c) They are not connected
d) None of the above
- 13) Find value of resistance in delta connection from star connected three 2Ω resistances
a) 2Ω b) 4Ω c) 6Ω d) 8Ω
- 14) In case of Kirchoff's current law following statement is correct
a) Algebraic sum of current meeting at node is zero
b) In-coming current is equal to outgoing current
c) Both a) and b)
d) None of the above
-



Seat No.	
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**F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

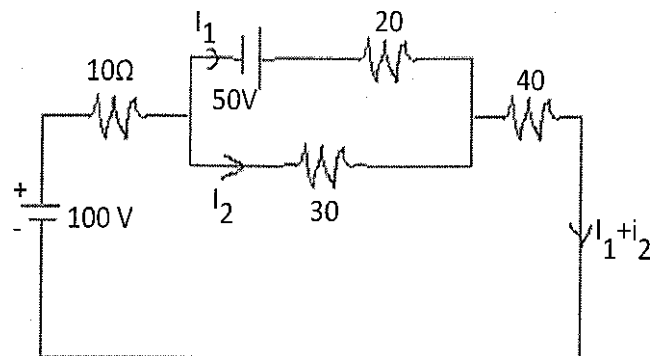
Instructions : 1) Figures to the **right** indicates **full** marks.
2) **Assume** suitable data **whenever** necessary.

SECTION – I

2. Solve **any four** :

(4x4=16)

a) Find current flowing through $30\ \Omega$ resistance.



- b) Define and derive expression for RMS value of sinusoidal alternating quantity.
- c) Explain the term magnetic leakage and fringing write their effect on magnetic circuit.
- d) A 60 Hz sinusoidal alternating current has peak of 14.14 A. Its zero crossing entering the +ve half cycle occurs at $t = 0$.
 - i) Write down the time equation for current
 - ii) Calculate R.M.S. and average value
 - iii) Determine the time taken to reach a value of -10 A for the 1st time in the cycle.
- e) An electric kettle is required to heat 6 liters of water from 17°C to 98°C in 25 minutes. Find the rating of kettle assuming the efficiency of 83%. If the kettle is to be operated on 230 V mains, find the resistance of heating element assume specific heat capacity of water to be 4200 J/Kg-K and 1 liter of water to have a mass of 1 kg.
- f) Explain the concept dynamically induced emf and give one example of electrical device working on this principal.

Set P



3. Solve :

- a) Explain with suitable sketches and waveforms the principles of generation of sinusoidal voltage. 6

OR

- b) A cast steel electromagnet has air gap of 2 mm length and iron path of length 30 cm. Determine the current in the coil required to produce a flux density of 0.8(T) in the air gap. The relative permeability of cast steel at the given flux density is 800 and the number of turns in the coil is 500.
- c) Explain the effect of temperature on conductors and derive the relation

$$\alpha_t = \frac{\alpha_0}{1 + t\alpha_0}$$

6

SECTION – II

4. Solve **any four** :

(4×4=16)

- a) Draw a impedance triangle and waveform of R-L ckt. comment on the power factor of circuit.
- b) A 200 KVA, 3300 V/240 V, 50 Hz single phase transformer has 80 turns on secondary winding. Calculate (a) the primary and secondary current on full load, (b) the max value of the flux and (c) the number of primary turns.
- c) Draw neat diagram of dc shunt motor and explain armature current versus speed characteristic.
- d) A delta connected load draw a current of 15 A at a lagging power factor of 0.85 from a 400 V, 3 phase, 50 Hz supply.
Calculate :
- i) Resistance and inductance of each phase
 - ii) Power consumed.
- e) Define the following with respect to single phase transformer.
- i) Voltage regulation
 - ii) KVA rating
 - iii) Current ratio
 - iv) Efficiency
- f) A coil having resistance of 6 ohms and inductance of 0.03 H is connected across a 50 V, 60 Hz supply. Calculate (i) Current (ii) Phase angle between current and applied vtg (iii) power factor.

5. Solve **any two** :

(2×6=12)

- a) Derive the relationship between phase current and line current in case of balanced delta connected load. Draw phaser diagram.
- b) A resistance of 12 ohms, an inductance of 0.15 H and a capacitance of 100 μF are connected in series across a 100 V, 50 Hz single phase a.c. supply. Calculate : (i) Current (ii) The voltage across inductance (iii) The voltage across the capacitance and (iv) The power factor of the ckt. Draw also the phasor diagram for the ckt.
- c) In a single phase 20 KVA 2000/200 V, 50 Hz, the iron and copper losses are 300 W and 350 W respectively. Calculate the efficiency at 0.8 p.f. lagging for (i) full load condition and (ii) 20% overload condition.

Set P



SLR-EP – 3

Seat No.	
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Set	Q
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**F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Figures to the **right** indicates **full** marks.
 - 2) **Assume** suitable data **whenever** necessary.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) A phasors are the
 - a) Vectors rotating the clockwise direction
 - b) Vectors rotating in anti clockwise direction
 - c) Non rotating vectors
 - d) None of these
- 2) The _____ through all the parts of the series magnetic circuit is same.
 - a) flux
 - b) reluctance
 - c) mmf
 - d) current
- 3) Hysteresis loop is a graph between
 - a) Flux and Reluctance
 - b) MMF and Reluctance
 - c) Flux and Absolute permeability
 - d) None of above
- 4) The best suitable magnetic material for construction of transformer core is
 - a) Silicon steel
 - b) Hard steel
 - c) Silicon steel sheet laminations
 - d) Hard steel sheet laminations
- 5) In DC shunt motor
 - a) Armature and field winding are connected in series
 - b) Armature and field winding are connected in parallel
 - c) They are not connected
 - d) None of the above

P.T.O.



- 6) Find value of resistance in delta connection from star connected three 2Ω resistances
a) 2Ω b) 4Ω c) 6Ω d) 8Ω
- 7) In case of Kirchoff's current law following statement is correct
a) Algebraic sum of current meeting at node is zero
b) In-coming current is equal to outgoing current
c) Both a) and b)
d) None of the above
- 8) A 3 phase supply system is symmetrical if all the three phases have the equal
a) Current b) Voltages c) Impedance d) Power factor
- 9) The impedance of purely capacitive circuit is given by
a) $z = R - jX_C$ b) $z = + jX_C$ c) $z = - jX_C$ d) $z = X_C + jR$
- 10) The real part of an admittance $Y = 0.1 + j 0.2$ is
a) Resistance b) Conductance
c) Inductance d) None of the above
- 11) In single phase steps up transformer
a) $N_1 < N_2$ b) $N_2 < N_1$ c) $V_2 < V_1$ d) $I_1 < I_2$
- 12) For R-L-C series circuit if $X_L = X_C$ then the expression for the power is, Apparent Power =
a) $P + jQ$ b) $P - jQ$ c) P d) Q
- 13) Energy of 1000 Wh is equivalent to
a) One unit of energy consumption
b) Thousand unit of energy consumption
c) 36×10^6 Joules
d) None of the above
- 14) The positive peak value of sinusoidal AC current is occurring at an angle
a) 60° b) 45° c) 30° d) 90°
-



Seat No.	
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F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

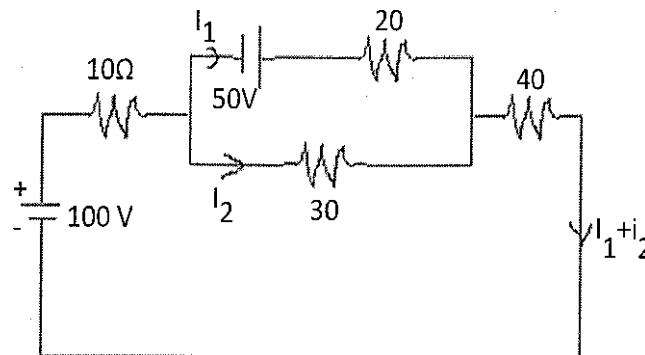
Instructions : 1) Figures to the **right** indicates **full** marks.
2) **Assume** suitable data **whenever** necessary.

SECTION – I

2. Solve **any four** :

(4×4=16)

a) Find current flowing through $30\ \Omega$ resistance.



- b) Define and derive expression for RMS value of sinusoidal alternating quantity.
- c) Explain the term magnetic leakage and fringing write their effect on magnetic circuit.
- d) A 60 Hz sinusoidal alternating current has peak of 14.14 A. Its zero crossing entering the +ve half cycle occurs at $t = 0$.
 - i) Write down the time equation for current
 - ii) Calculate R.M.S. and average value
 - iii) Determine the time taken to reach a value of -10 A for the 1st time in the cycle.
- e) An electric kettle is required to heat 6 liters of water from 17°C to 98°C in 25 minutes. Find the rating of kettle assuming the efficiency of 83%. If the kettle is to be operated on 230 V mains, find the resistance of heating element assume specific heat capacity of water to be 4200 J/Kg-K and 1 liter of water to have a mass of 1 kg.
- f) Explain the concept dynamically induced emf and give one example of electrical device working on this principal.

Set Q



3. Solve :

- a) Explain with suitable sketches and waveforms the principles of generation of sinusoidal voltage. 6

OR

- b) A cast steel electromagnet has air gap of 2 mm length and iron path of length 30 cm. Determine the current in the coil required to produce a flux density of 0.8(T) in the air gap. The relative permeability of cast steel at the given flux density is 800 and the number of turns in the coil is 500.
- c) Explain the effect of temperature on conductors and derive the relation

$$\alpha_t = \frac{\alpha_0}{1 + t\alpha_0}$$

6

SECTION – II

4. Solve **any four** :

(4×4=16)

- a) Draw a impedance triangle and waveform of R-L ckt. comment on the power factor of circuit.
- b) A 200 KVA, 3300 V/240 V, 50 Hz single phase transformer has 80 turns on secondary winding. Calculate (a) the primary and secondary current on full load, (b) the max value of the flux and (c) the number of primary turns.
- c) Draw neat diagram of dc shunt motor and explain armature current versus speed characteristic.
- d) A delta connected load draw a current of 15 A at a lagging power factor of 0.85 from a 400 V, 3 phase, 50 Hz supply.
Calculate :
i) Resistance and inductance of each phase
ii) Power consumed.
- e) Define the following with respect to single phase transformer.
i) Voltage regulation ii) KVA rating iii) Current ratio iv) Efficiency
- f) A coil having resistance of 6 ohms and inductance of 0.03 H is connected across a 50 V, 60 Hz supply. Calculate (i) Current (ii) Phase angle between current and applied vtg (iii) power factor.

5. Solve **any two** :

(2×6=12)

- a) Derive the relationship between phase current and line current in case of balanced delta connected load. Draw phaser diagram.
- b) A resistance of 12 ohms, an inductance of 0.15 H and a capacitance of 100 μ F are connected in series across a 100 V, 50 Hz single phase a.c. supply. Calculate : (i) Current (ii) The voltage across inductance (iii) The voltage across the capacitance and (iv) The power factor of the ckt. Draw also the phasor diagram for the ckt.
- c) In a single phase 20 KVA 2000/200 V, 50 Hz, the iron and copper losses are 300 W and 350 W respectively. Calculate the efficiency at 0.8 p.f. lagging for (i) full load condition and (ii) 20% overload condition.

Set Q



SLR-EP – 3

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**F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Figures to the **right** indicates **full** marks.
 - 2) **Assume** suitable data **whenever** necessary.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) For R-L-C series circuit if $X_L = X_C$ then the expression for the power is, Apparent Power =
a) $P + jQ$ b) $P - jQ$ c) P d) Q
 - 2) Energy of 1000 Wh is equivalent to
a) One unit of energy consumption
b) Thousand unit of energy consumption
c) 36×10^6 Joules
d) None of the above
 - 3) The positive peak value of sinusoidal AC current is occurring at an angle
a) 60° b) 45° c) 30° d) 90°
 - 4) A phasors are the
a) Vectors rotating the clockwise direction
b) Vectors rotating in anti clockwise direction
c) Non rotating vectors
d) None of these
 - 5) The _____ through all the parts of the series magnetic circuit is same.
a) flux b) reluctance c) mmf d) current

P.T.O.



- 6) Hysteresis loop is a graph between
a) Flux and Reluctance b) MMF and Reluctance
c) Flux and Absolute permeability d) None of above
- 7) The best suitable magnetic material for construction of transformer core is
a) Silicon steel b) Hard steel
c) Silicon steel sheet laminations d) Hard steel sheet laminations
- 8) In DC shunt motor
a) Armature and field winding are connected in series
b) Armature and field winding are connected in parallel
c) They are not connected
d) None of the above
- 9) Find value of resistance in delta connection from star connected three 2Ω resistances
a) 2Ω b) 4Ω c) 6Ω d) 8Ω
- 10) In case of Kirchoff's current law following statement is correct
a) Algebraic sum of current meeting at node is zero
b) In-coming current is equal to outgoing current
c) Both a) and b)
d) None of the above
- 11) A 3 phase supply system is symmetrical if all the three phases have the equal
a) Current b) Voltages c) Impedance d) Power factor
- 12) The impedance of purely capacitive circuit is given by
a) $z = R - jX_C$ b) $z = + jX_C$ c) $z = - jX_C$ d) $z = X_C + jR$
- 13) The real part of an admittance $Y = 0.1 + j 0.2$ is
a) Resistance b) Conductance
c) Inductance d) None of the above
- 14) In single phase steps up transformer
a) $N_1 < N_2$ b) $N_2 < N_1$ c) $V_2 < V_1$ d) $I_1 < I_2$
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**F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

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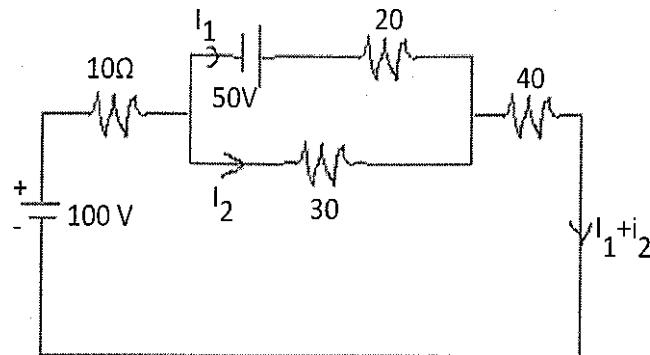
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SECTION – I

2. Solve **any four** :

(4×4=16)

a) Find current flowing through $30\ \Omega$ resistance.



- b) Define and derive expression for RMS value of sinusoidal alternating quantity.
- c) Explain the term magnetic leakage and fringing write their effect on magnetic circuit.
- d) A 60 Hz sinusoidal alternating current has peak of 14.14 A. Its zero crossing entering the +ve half cycle occurs at $t = 0$.
 - i) Write down the time equation for current
 - ii) Calculate R.M.S. and average value
 - iii) Determine the time taken to reach a value of -10 A for the 1st time in the cycle.
- e) An electric kettle is required to heat 6 liters of water from 17°C to 98°C in 25 minutes. Find the rating of kettle assuming the efficiency of 83%. If the kettle is to be operated on 230 V mains, find the resistance of heating element assume specific heat capacity of water to be 4200 J/Kg-K and 1 liter of water to have a mass of 1 kg.
- f) Explain the concept dynamically induced emf and give one example of electrical device working on this principal.

Set R



3. Solve :

- a) Explain with suitable sketches and waveforms the principles of generation of sinusoidal voltage. 6

OR

- b) A cast steel electromagnet has air gap of 2 mm length and iron path of length 30 cm. Determine the current in the coil required to produce a flux density of 0.8(T) in the air gap. The relative permeability of cast steel at the given flux density is 800 and the number of turns in the coil is 500.
- c) Explain the effect of temperature on conductors and derive the relation

$$\alpha_t = \frac{\alpha_0}{1 + t\alpha_0} \cdot$$

6

SECTION – II

4. Solve **any four** :

(4×4=16)

- a) Draw a impedance triangle and waveform of R-L ckt. comment on the power factor of circuit.
- b) A 200 KVA, 3300 V/240 V, 50 Hz single phase transformer has 80 turns on secondary winding. Calculate (a) the primary and secondary current on full load, (b) the max value of the flux and (c) the number of primary turns.
- c) Draw neat diagram of dc shunt motor and explain armature current versus speed characteristic.
- d) A delta connected load draw a current of 15 A at a lagging power factor of 0.85 from a 400 V, 3 phase, 50 Hz supply.
Calculate :
- i) Resistance and inductance of each phase
 - ii) Power consumed.
- e) Define the following with respect to single phase transformer.
- i) Voltage regulation
 - ii) KVA rating
 - iii) Current ratio
 - iv) Efficiency
- f) A coil having resistance of 6 ohms and inductance of 0.03 H is connected across a 50 V, 60 Hz supply. Calculate (i) Current (ii) Phase angle between current and applied vtg (iii) power factor.

5. Solve **any two** :

(2×6=12)

- a) Derive the relationship between phase current and line current in case of balanced delta connected load. Draw phaser diagram.
- b) A resistance of 12 ohms, an inductance of 0.15 H and a capacitance of 100 μ F are connected in series across a 100 V, 50 Hz single phase a.c. supply. Calculate : (i) Current (ii) The voltage across inductance (iii) The voltage across the capacitance and (iv) The power factor of the ckt. Draw also the phasor diagram for the ckt.
- c) In a single phase 20 KVA 2000/200 V, 50 Hz, the iron and copper losses are 300 W and 350 W respectively. Calculate the efficiency at 0.8 p.f. lagging for (i) full load condition and (ii) 20% overload condition.



SLR-EP – 3

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**F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Hysteresis loop is a graph between
 - a) Flux and Reluctance
 - b) MMF and Reluctance
 - c) Flux and Absolute permeability
 - d) None of above
- 2) The best suitable magnetic material for construction of transformer core is
 - a) Silicon steel
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- 4) Find value of resistance in delta connection from star connected three 2Ω resistances
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P.T.O.



- 6) A 3 phase supply system is symmetrical if all the three phases have the equal
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- a) Vectors rotating the clockwise direction
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- 14) The _____ through all the parts of the series magnetic circuit is same.
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Seat No.	
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F.E. (Part – I) (New CBCS) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

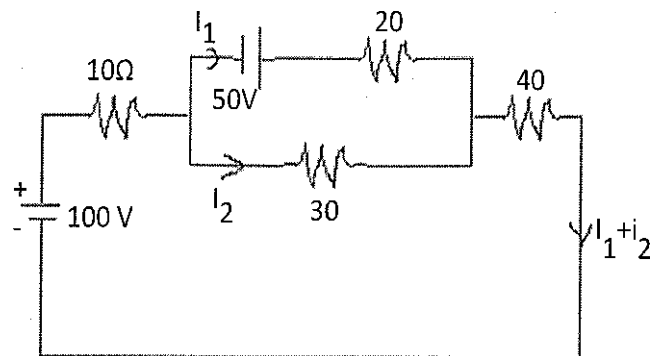
Instructions: 1) Figures to the right indicates full marks.
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SECTION – I

2. Solve any four :

(4×4=16)

a) Find current flowing through $30\ \Omega$ resistance.



- b) Define and derive expression for RMS value of sinusoidal alternating quantity.
- c) Explain the term magnetic leakage and fringing write their effect on magnetic circuit.
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3. Solve :

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- c) Explain the effect of temperature on conductors and derive the relation

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6

SECTION – II

4. Solve **any four** :

(4×4=16)

- a) Draw a impedance triangle and waveform of R-L ckt. comment on the power factor of circuit.
- b) A 200 KVA, 3300 V/240 V, 50 Hz single phase transformer has 80 turns on secondary winding. Calculate (a) the primary and secondary current on full load, (b) the max value of the flux and (c) the number of primary turns.
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5. Solve **any two** :

(2×6=12)

- a) Derive the relationship between phase current and line current in case of balanced delta connected load. Draw phaser diagram.
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- c) In a single phase 20 KVA 2000/200 V, 50 Hz, the iron and copper losses are 300 W and 350 W respectively. Calculate the efficiency at 0.8 p.f. lagging for (i) full load condition and (ii) 20% overload condition.



SLR-EP – 4

Seat No.	
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Q. 2 and Q. 4 are short answer type questions.**
 - 3) **Q. 3 and Q. 5 are long answer type questions.**
 - 4) **Figures to the right indicate full marks.**
 - 5) **Assume suitable data if necessary and mention them clearly.**
 - 6) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 7) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Which of the following is not a property of the system ?
a) Temperature b) Pressure c) Heat d) Volume
- 2) Second law of thermodynamics defines
a) Enthalpy b) Entropy c) Heat d) Work
- 3) For the same expansion ratio, work done by the gas in case of adiabatic process as compared to work done in case of isothermal process is
a) Same b) More
c) Less d) None of the above
- 4) An isothermal process is governed by
a) Charle's law b) Boyle's law
c) Joules law d) Gay-Lussac law
- 5) For low head and high discharge which pump is used
a) Centrifugal pump b) Reciprocating pumps
c) Vane pumps d) None
- 6) The flow of water at entry of Kaplan Turbine is _____
a) Radial b) Tangential c) Axial d) None
- 7) To reduce excessive pressure of water in the pipeline to turbine the device used is
a) Track rash b) Valve c) Surge Tank d) Breaking jet

P.T.O.



Seat No.	
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

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 - 5) **Assume suitable data if necessary and mention them clearly.**

SECTION – I

2. Solve **any five** out of seven : **(5×3=15)**

- a) State and explain second law of thermodynamics.
- b) A cycle consists of four processes; the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle.

Process	Q (kW)	W (kW)	Δ U (kW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

- c) Explain with neat sketch Window air conditioner.
- d) Derive relation between C_p , C_v , R and γ .
- e) Explain with neat sketch Roots Blower.
- f) Compare impulse and reaction turbine.
- g) Differentiate between BWR and PWR.

3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**

- a) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The Sp. Volume of the fluid, pressure and velocity at the inlet are 0.45 m³/kg, 10 bar and 20 m/sec. The inlet is 36 m above the floor and discharge is at the floor level. The discharge conditions are 0.8 m³/kg, 3 bar and 320 m/sec respectively. The total heat loss between inlet and discharge is 12 kJ/kg of the fluid. Find the change in Sp. internal energy. **5**
- b) Explain with neat sketch working of Hydro-electric power plant. State its advantage and disadvantages. **5**

Set P



- c) 1 kg of air at 10 bar and 0.15 m³ volume is expanded to volume of 0.75 m³. Determine the final temperature, work done and heat transfer during the process, if the expansion is at constant pressure. Take $R = 0.287$ kJ/kgk, $C_v = 0.7$ kJ/kgk for air. 4
- d) Explain Single Acting Reciprocating Pump with neat sketch. 4
- e) Explain with neat sketch working of Steam Power plant. 4
- f) A cylinder contains 10 kg of working fluid. During period, piston moves out and the temperature of the system falls from 125°C to 65°C. Heat rejected through the cylinder walls is 40 kJ. The sp. internal energy and temperature are related to each other by law $u = [50 + t/1.5]$ kJ/kg, where 't' is in °C. Calculate the work transferred. 4

SECTION – II

4. Solve **any five** out of seven : (5×3=15)
- Write the difference between SI and CI Engine.
 - In an air standard Otto cycle pressure ratio during the compression is 18. The temperature of air at beginning of compression is 27°C. Maximum temperature attained in a cycle is 2200°C. Determine thermal efficiency of cycle and work done.
 - Compare belt drive with chain drive.
 - Explain types of gear train with neat sketch.
 - Write a note on sustainable design.
 - Explain different modes of failure while designing a machine component.
 - Explain different operations in Lathe Machine.
5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : 13
- Two pulley one 600 mm diameter and other 400 mm diameter are on parallel shaft are 4 meter apart are connected by cross belt drive. Find length of belt required and angle of contact between belt and pulley. What power can be transmitted when larger pulley rotates at 450 rpm, if maximum permissible tension is 3 kN and coefficient of friction between belt and pulley is 0.3 ? 5
 - Draw block diagram of Pillar Drilling Machine. Explain function of basic elements. 5
 - An air standard diesel cycle has compression ratio of 18 and the heat addition referred to working fluid per cycle 1800 kJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Find Thermal efficiency. 4
 - Explain stepwise design procedure while designing of any mechanical component. 4
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. 4
 - State advantages and limitations of gas welding. 4



SLR-EP – 4

Seat No.	
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Set	Q
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
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Day and Date : Monday, 19-12-2016

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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Thermal efficiency of a four stroke cycle engine as compare to two stroke cycle engine is
 - a) More
 - b) Less
 - c) Same
 - d) None of the above
- 2) Otto cycle is also called as
 - a) Constant pressure cycle
 - b) Constant volume cycle
 - c) Constant temperature cycle
 - d) None
- 3) For maximum power transmission centrifugal tension in the belt
 - a) $T_c = T_{max}$
 - b) $T_c = T_1 + T_2$
 - c) $T_c = T_{max}/3$
 - d) $T_c = T_{max} - T_1$
- 4) If for power transmission, a simple gear train consisting of 8 gears is used, then the motion of the driver and follower will be in the
 - a) Same direction
 - b) Opposite direction
 - c) Both a) and b)
 - d) None of the above

P.T.O.



- 5) Man, machine and working environment relationship is considered while designing a product in
- a) Ergonomic consideration
 - b) Thermodynamics
 - c) Air conditioning
 - d) Aesthetic consideration
- 6) Sustainable design consist of
- a) Use of recycled material
 - b) Less consumption of natural resources
 - c) Eco-friendly design
 - d) All of above
- 7) Which of the following welding process requires external pressure ?
- a) Electric arc welding
 - b) Oxyacetylene gas welding
 - c) Spot welding
 - d) None
- 8) Which of the following is not a property of the system ?
- a) Temperature
 - b) Pressure
 - c) Heat
 - d) Volume
- 9) Second law of thermodynamics defines
- a) Enthalpy
 - b) Entropy
 - c) Heat
 - d) Work
- 10) For the same expansion ratio, work done by the gas in case of adiabatic process as compared to work done in case of isothermal process is
- a) Same
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Q. 2 and Q. 4 are short answer type questions.**
 - 3) **Q. 3 and Q. 5 are long answer type questions.**
 - 4) **Figures to the right indicate full marks.**
 - 5) **Assume suitable data if necessary and mention them clearly.**

SECTION – I

2. Solve **any five** out of seven : **(5×3=15)**

- a) State and explain second law of thermodynamics.
- b) A cycle consists of four processes; the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle.

Process	Q (kW)	W (kW)	ΔU (kW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

- c) Explain with neat sketch Window air conditioner.
- d) Derive relation between C_p , C_v , R and γ .
- e) Explain with neat sketch Roots Blower.
- f) Compare impulse and reaction turbine.
- g) Differentiate between BWR and PWR.

3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**

- a) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The Sp. Volume of the fluid, pressure and velocity at the inlet are 0.45 m³/kg, 10 bar and 20 m/sec. The inlet is 36 m above the floor and discharge is at the floor level. The discharge conditions are 0.8 m³/kg, 3 bar and 320 m/sec respectively. The total heat loss between inlet and discharge is 12 kJ/kg of the fluid. Find the change in Sp. internal energy. **5**
- b) Explain with neat sketch working of Hydro-electric power plant. State its advantage and disadvantages. **5**

Set Q



- c) 1 kg of air at 10 bar and 0.15 m³ volume is expanded to volume of 0.75 m³. Determine the final temperature, work done and heat transfer during the process, if the expansion is at constant pressure. Take $R = 0.287$ kJ/kgk, $C_v = 0.7$ kJ/kgk for air. **4**
- d) Explain Single Acting Reciprocating Pump with neat sketch. **4**
- e) Explain with neat sketch working of Steam Power plant. **4**
- f) A cylinder contains 10 kg of working fluid. During period, piston moves out and the temperature of the system falls from 125°C to 65°C. Heat rejected through the cylinder walls is 40 kJ. The sp. internal energy and temperature are related to each other by law $u = [50 + t/1.5]$ kJ/kg, where 't' is in °C. Calculate the work transferred. **4**

SECTION – II

4. Solve **any five** out of seven : **(5×3=15)**
- Write the difference between SI and CI Engine.
 - In an air standard Otto cycle pressure ratio during the compression is 18. The temperature of air at beginning of compression is 27°C. Maximum temperature attained in a cycle is 2200°C. Determine thermal efficiency of cycle and work done.
 - Compare belt drive with chain drive.
 - Explain types of gear train with neat sketch.
 - Write a note on sustainable design.
 - Explain different modes of failure while designing a machine component.
 - Explain different operations in Lathe Machine.
5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- Two pulley one 600 mm diameter and other 400 mm diameter are on parallel shaft are 4 meter apart are connected by cross belt drive. Find length of belt required and angle of contact between belt and pulley. What power can be transmitted when larger pulley rotates at 450 rpm, if maximum permissible tension is 3 kN and coefficient of friction between belt and pulley is 0.3 ? **5**
 - Draw block diagram of Pillar Drilling Machine. Explain function of basic elements. **5**
 - An air standard diesel cycle has compression ratio of 18 and the heat addition referred to working fluid per cycle 1800 kJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Find Thermal efficiency. **4**
 - Explain stepwise design procedure while designing of any mechanical component. **4**
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. **4**
 - State advantages and limitations of gas welding. **4**



SLR-EP – 4

Seat No.	
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Set	R
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) Q. 2 and Q. 4 are **short** answer type questions.
 - 3) Q. 3 and Q. 5 are **long** answer type questions.
 - 4) Figures to the **right** indicate **full** marks.
 - 5) Assume suitable data **if necessary** and mention them **clearly**.
 - 6) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 7) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) For low head and high discharge which pump is used
 - a) Centrifugal pump
 - b) Reciprocating pumps
 - c) Vane pumps
 - d) None
- 2) The flow of water at entry of Kaplan Turbine is _____
 - a) Radial
 - b) Tangential
 - c) Axial
 - d) None
- 3) To reduce excessive pressure of water in the pipeline to turbine the device used is
 - a) Track rash
 - b) Valve
 - c) Surge Tank
 - d) Breaking jet
- 4) Thermal efficiency of a four stroke cycle engine as compare to two stroke cycle engine is
 - a) More
 - b) Less
 - c) Same
 - d) None of the above
- 5) Otto cycle is also called as
 - a) Constant pressure cycle
 - b) Constant volume cycle
 - c) Constant temperature cycle
 - d) None
- 6) For maximum power transmission centrifugal tension in the belt
 - a) $T_c = T_{max}$
 - b) $T_c = T_1 + T_2$
 - c) $T_c = T_{max}/3$
 - d) $T_c = T_{max} - T_1$

P.T.O.



Seat No.	
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) **All questions are compulsory.**
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SECTION – I

2. Solve **any five** out of seven : **(5×3=15)**

- a) State and explain second law of thermodynamics.
- b) A cycle consists of four processes; the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle.

Process	Q (kW)	W (kW)	ΔU (kW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

- c) Explain with neat sketch Window air conditioner.
- d) Derive relation between C_p , C_v , R and γ .
- e) Explain with neat sketch Roots Blower.
- f) Compare impulse and reaction turbine.
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- a) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The Sp. Volume of the fluid, pressure and velocity at the inlet are 0.45 m³/kg, 10 bar and 20 m/sec. The inlet is 36 m above the floor and discharge is at the floor level. The discharge conditions are 0.8 m³/kg, 3 bar and 320 m/sec respectively. The total heat loss between inlet and discharge is 12 kJ/kg of the fluid. Find the change in Sp. internal energy. **5**
- b) Explain with neat sketch working of Hydro-electric power plant. State its advantage and disadvantages. **5**

Set R



- c) 1 kg of air at 10 bar and 0.15 m³ volume is expanded to volume of 0.75 m³. Determine the final temperature, work done and heat transfer during the process, if the expansion is at constant pressure. Take $R = 0.287$ kJ/kgk, $C_v = 0.7$ kJ/kgk for air. **4**
- d) Explain Single Acting Reciprocating Pump with neat sketch. **4**
- e) Explain with neat sketch working of Steam Power plant. **4**
- f) A cylinder contains 10 kg of working fluid. During period, piston moves out and the temperature of the system falls from 125°C to 65°C. Heat rejected through the cylinder walls is 40 kJ. The sp. internal energy and temperature are related to each other by law $u = [50 + t/1.5]$ kJ/kg, where 't' is in °C. Calculate the work transferred. **4**

SECTION – II

4. Solve **any five** out of seven : **(5×3=15)**
- Write the difference between SI and CI Engine.
 - In an air standard Otto cycle pressure ratio during the compression is 18. The temperature of air at beginning of compression is 27°C. Maximum temperature attained in a cycle is 2200°C. Determine thermal efficiency of cycle and work done.
 - Compare belt drive with chain drive.
 - Explain types of gear train with neat sketch.
 - Write a note on sustainable design.
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5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- Two pulley one 600 mm diameter and other 400 mm diameter are on parallel shaft are 4 meter apart are connected by cross belt drive. Find length of belt required and angle of contact between belt and pulley. What power can be transmitted when larger pulley rotates at 450 rpm, if maximum permissible tension is 3 kN and coefficient of friction between belt and pulley is 0.3 ? **5**
 - Draw block diagram of Pillar Drilling Machine. Explain function of basic elements. **5**
 - An air standard diesel cycle has compression ratio of 18 and the heat addition referred to working fluid per cycle 1800 kJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Find Thermal efficiency. **4**
 - Explain stepwise design procedure while designing of any mechanical component. **4**
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. **4**
 - State advantages and limitations of gas welding. **4**



SLR-EP – 4

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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) For maximum power transmission centrifugal tension in the belt
 - a) $T_c = T_{max}$
 - b) $T_c = T_1 + T_2$
 - c) $T_c = T_{max}/3$
 - d) $T_c = T_{max} - T_1$
- 2) If for power transmission, a simple gear train consisting of 8 gears is used, then the motion of the driver and follower will be in the
 - a) Same direction
 - b) Opposite direction
 - c) Both a) and b)
 - d) None of the above
- 3) Man, machine and working environment relationship is considered while designing a product in
 - a) Ergonomic consideration
 - b) Thermodynamics
 - c) Air conditioning
 - d) Aesthetic consideration
- 4) Sustainable design consist of
 - a) Use of recycled material
 - b) Less consumption of natural resources
 - c) Eco-friendly design
 - d) All of above

P.T.O.



- 5) Which of the following welding process requires external pressure ?
- a) Electric arc welding b) Oxyacetylene gas welding
c) Spot welding d) None
- 6) Which of the following is not a property of the system ?
- a) Temperature b) Pressure c) Heat d) Volume
- 7) Second law of thermodynamics defines
- a) Enthalpy b) Entropy c) Heat d) Work
- 8) For the same expansion ratio, work done by the gas in case of adiabatic process as compared to work done in case of isothermal process is
- a) Same b) More
c) Less d) None of the above
- 9) An isothermal process is governed by
- a) Charle's law b) Boyle's law
c) Joules law d) Gay-Lussac law
- 10) For low head and high discharge which pump is used
- a) Centrifugal pump b) Reciprocating pumps
c) Vane pumps d) None
- 11) The flow of water at entry of Kaplan Turbine is _____
- a) Radial b) Tangential c) Axial d) None
- 12) To reduce excessive pressure of water in the pipeline to turbine the device used is
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**F.E. (Part – I) (New) (CBCS) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
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SECTION – I

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Set S



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SECTION – II

4. Solve **any five** out of seven : **(5×3=15)**
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 - State advantages and limitations of gas welding. **4**



Seat No.	
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Set	P
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct option :

14

- 1) The constant term in the expansion of $\log(1 + \sin x)$ is
 - a) 1
 - b) -1
 - c) $\frac{1}{2}$
 - d) 0
- 2) If $y = (-2)^x$ then $y_n =$
 - a) $2^n (-2)^x$
 - b) $2^n (\log 2)^x$
 - c) $-(2)^n (-2)^x$
 - d) None of these
- 3) If $y = \cos^2 x$ then $y_n =$
 - a) $2^n \cos\left(2x + \frac{n\pi}{2}\right)$
 - b) $2^{n-1} \cos\left(2x + \frac{n\pi}{2}\right)$
 - c) $2 \cos\left(2x + \frac{n\pi}{2}\right)$
 - d) None
- 4) The hyperbolic $\operatorname{sech}(ix)$ is
 - a) $\sec x$
 - b) $i \sec x$
 - c) $-\sec x$
 - d) None of these
- 5) The imaginary part of $\cos h(x + iy)$ is
 - a) $\sin x \sin hy$
 - b) $-\sin x \sin hy$
 - c) $\sin hx \sin y$
 - d) $\sin hx \sin hy$
- 6) The argument of complex number $(1 - \cos \alpha) + i \sin \alpha$ is
 - a) $\frac{\pi}{4} - \frac{\alpha}{2}$
 - b) $\frac{\pi}{2} - \alpha$
 - c) $\frac{\pi}{2} - \frac{\alpha}{2}$
 - d) $\frac{\pi}{2} - \frac{\alpha}{4}$

P.T.O.



- 7) The real part of $e^{5+i\frac{\pi}{2}}$ is
a) ie^5 b) $-ie^5$ c) e^5 d) None
- 8) The rank of the matrix $\begin{bmatrix} 555 & 666 & 888 \\ 555 & 666 & 888 \\ 555 & 666 & 888 \end{bmatrix}$ is
a) 0 b) 1 c) 2 d) 3
- 9) The system $3x + 4y + 2z = 4$, $9x + 12z + 6z = 12$ has
a) Infinitely many solutions
b) No solution
c) Unique solution
d) Linearly independent solutions
- 10) If 2, 3, 4 are the eigen values of A, then determinant of A is equal to
a) 9 b) $\frac{1}{9}$ c) 24 d) $\frac{1}{24}$
- 11) If $X_1, X_2, X_3, \dots, X_n$ are linearly dependent vectors, then the vectors X_1, X_2, \dots, X_{n-1} are
a) Linearly dependent b) All zero
c) All equal d) Linearly independent
- 12) If $f(x) = \log(x \tan^{-1}y)$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to
a) $-\frac{1}{x^2}$ b) 0
c) $\frac{1}{x}$ d) $\frac{1}{x^2}$
- 13) If $u = \frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}}$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$
a) 4u b) 5u
c) 20u d) $\frac{u}{20}$
- 14) If $u = x^2 + y^2$, then the approximate value of u when $x = 1.1$ and $y = 2.1$ is
a) 5.6 b) $(1.1)^2$
c) $(2.1)^2$ d) 4.3
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Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.

SECTION – I

2. a) If $\sin (\theta + i\phi) = \rho(\cos \alpha + i \sin \alpha)$, prove $\rho^2 = \frac{1}{2} [\cosh 2\phi - \cos 2\theta]$. **3**
- b) If $\log (x + iy) = e^p + iq$ prove that $y = x \tan \theta$ where $2\theta = \tan q \log (x^2 + y^2)$. **3**
- c) Prove that $\tan^{-1} (\sin \theta) = \cosh^{-1} (\sec \theta)$. **3**

3. a) If $x_r = \cos \frac{\pi}{3^r} + i \sin \frac{\pi}{3^r}$ prove that $x_1, x_2 \dots x_\infty = i$. **3**
- b) Express $\cos 8\theta$ in powers of $\sin \theta$ and $\cos \theta$. **3**
- c) Find the roots of $x^5 = 1 + i$. **3**

4. a) If $y = \frac{x^4}{(x-1)(x-2)}$ find y_n . **3**
- b) If $y = e^{2x} \sin \frac{x}{2} \cos \frac{3x}{2}$ find y_n . **3**
- c) If $x = e^t$ and $y = \cos mt$ prove that $x^2 y_{n+2} + (2n+1) x y_{n+1} + (n^2+m^2) y_n = 0$. **(3+1=4)**

5. a) Prove that $\sin (e^x - 1) = x + \frac{x^2}{2} - \frac{5}{24} x^4 + \dots$ **3**
- b) Expand $f(x) = x^3 + 3x^2 + 15x - 10$ in powers of $(x - 1)$ and hence find $f\left(\frac{11}{10}\right)$. **3**
- c) Evaluate $\lim_{x \rightarrow 1} \left[\frac{1}{\log x} - \frac{x}{x-1} \right]$. **3**

OR

- c) Expand $\log (\sec x + \tan x)$ by using Maclaurins theorem upto power x^3 . **3**



SECTION – II

6. Attempt the following :

a) Find the rank of the following matrix by reducing it to normal form $A = \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$. 3

b) Test the consistency and hence solve the following set of equation

$$x_1 + 2x_2 + x_3 = 2$$

$$3x_1 + x_2 - 2x_3 = 1$$

$$4x_1 - 3x_2 - x_3 = 3$$

$$2x_1 + 4x_2 + 2x_3 = 4$$

3

c) Find the values of k such that the system of equations

$$x + ky + 3z = 0$$

$$4x + 3y + kz = 0$$

$$2x + y + 2z = 0 \text{ has non-trivial solution.}$$

3

7. Attempt the following :

a) Examine for linear independent the following set of vectors

$$[2, -1, 4], [0, 1, 2], [6, -1, 16], [4, 0, 12].$$

3

b) Find all the eigen values and eigen vector corresponding to the largest eigen value

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

3

c) Find the characteristic equation of the matrix A given below and hence, find the matrix

represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. 3

8. Attempt the following :

a) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$. 5

b) If $u = \tan^{-1} \left[\frac{x^3 + y^3}{2x + 3y} \right]$, prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \sin 4u = \sin 2u$. 4

9. Attempt the following :

a) Find approximate value of $[(0.98)^2 + (2.01)^2 + (1.94)^2]^{1/2}$. 3

b) If $u = \frac{x+y}{1-xy}$, $v = \tan^{-1}x + \tan^{-1}y$ find $\frac{\partial(u, v)}{\partial(x, y)}$. 3

c) Examine the function $f(x, y) = y^2 + 4xy + 3x^2 + x^3$ for extreme values. 4



- 5) If $f(x) = \log(x \tan^{-1}y)$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to
- a) $-\frac{1}{x^2}$ b) 0 c) $\frac{1}{x}$ d) $\frac{1}{x^2}$
- 6) If $u = \frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}}$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$
- a) 4u b) 5u
c) 20u d) $\frac{u}{20}$
- 7) If $u = x^2 + y^2$, then the approximate value of u when $x = 1.1$ and $y = 2.1$ is
- a) 5.6 b) $(1.1)^2$
c) $(2.1)^2$ d) 4.3
- 8) The constant term in the expansion of $\log(1 + \sin x)$ is
- a) 1 b) -1 c) $\frac{1}{2}$ d) 0
- 9) If $y = (-2)^x$ then $y_n =$
- a) $2^n (-2)^x$ b) $2^n (\log 2)^x$ c) $-(2)^n (-2)^x$ d) None of these
- 10) If $y = \cos^2 x$ then $y_n =$
- a) $2^n \cos\left(2x + \frac{n\pi}{2}\right)$ b) $2^{n-1} \cos\left(2x + \frac{n\pi}{2}\right)$
c) $2 \cos\left(2x + \frac{n\pi}{2}\right)$ d) None
- 11) The hyperbolic sech (ix) is
- a) $\sec x$ b) $i \sec x$
c) $-\sec x$ d) None of these
- 12) The imaginary part of $\cos h(x + iy)$ is
- a) $\sin x \sin hy$ b) $-\sin x \sin hy$
c) $\sin hx \sin y$ d) $\sin hx \sin hy$
- 13) The argument of complex number $(1 - \cos \alpha) + i \sin \alpha$ is
- a) $\frac{\pi}{4} - \frac{\alpha}{2}$ b) $\frac{\pi}{2} - \alpha$
c) $\frac{\pi}{2} - \frac{\alpha}{2}$ d) $\frac{\pi}{2} - \frac{\alpha}{4}$
- 14) The real part of $e^{5+i\frac{\pi}{2}}$ is
- a) ie^5 b) $-ie^5$ c) e^5 d) None



Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.

SECTION – I

2. a) If $\sin((\theta + i\phi)) = \rho(\cos \alpha + i \sin \alpha)$, prove $\rho^2 = \frac{1}{2} [\cosh 2\phi - \cos 2\theta]$. **3**
- b) If $\log(x + iy) = e^p + iq$ prove that $y = x \tan \theta$ where $2\theta = \tan^{-1} q \log(x^2 + y^2)$. **3**
- c) Prove that $\tan^{-1}(\sin \theta) = \cosh^{-1}(\sec \theta)$. **3**
3. a) If $x_r = \cos \frac{\pi}{3^r} + i \sin \frac{\pi}{3^r}$ prove that $x_1, x_2 \dots x_\infty = i$. **3**
- b) Express $\cos 8\theta$ in powers of $\sin \theta$ and $\cos \theta$. **3**
- c) Find the roots of $x^5 = 1 + i$. **3**
4. a) If $y = \frac{x^4}{(x-1)(x-2)}$ find y_n . **3**
- b) If $y = e^{2x} \sin \frac{x}{2} \cos \frac{3x}{2}$ find y_n . **3**
- c) If $x = e^t$ and $y = \cos mt$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+m^2)y_n = 0$. **(3+1=4)**
5. a) Prove that $\sin(e^x - 1) = x + \frac{x^2}{2} - \frac{5}{24}x^4 + \dots$ **3**
- b) Expand $f(x) = x^3 + 3x^2 + 15x - 10$ in powers of $(x - 1)$ and hence find $f\left(\frac{11}{10}\right)$. **3**
- c) Evaluate $\lim_{x \rightarrow 1} \left[\frac{1}{\log x} - \frac{x}{x-1} \right]$. **3**
- OR
- c) Expand $\log(\sec x + \tan x)$ by using Maclaurin's theorem upto power x^3 . **3**



SECTION – II

6. Attempt the following :

a) Find the rank of the following matrix by reducing it to normal form $A = \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$. 3

b) Test the consistency and hence solve the following set of equation

$$x_1 + 2x_2 + x_3 = 2$$

$$3x_1 + x_2 - 2x_3 = 1$$

$$4x_1 - 3x_2 - x_3 = 3$$

$$2x_1 + 4x_2 + 2x_3 = 4$$

3

c) Find the values of k such that the system of equations

$$x + ky + 3z = 0$$

$$4x + 3y + kz = 0$$

$$2x + y + 2z = 0 \text{ has non-trivial solution.}$$

3

7. Attempt the following :

a) Examine for linear independent the following set of vectors

$$[2, -1, 4], [0, 1, 2], [6, -1, 16], [4, 0, 12].$$

3

b) Find all the eigen values and eigen vector corresponding to the largest eigen value

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

3

c) Find the characteristic equation of the matrix A given below and hence, find the matrix

represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. 3

8. Attempt the following :

a) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$. 5

b) If $u = \tan^{-1} \left[\frac{x^3 + y^3}{2x + 3y} \right]$, prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \sin 4u = \sin 2u$. 4

9. Attempt the following :

a) Find approximate value of $[(0.98)^2 + (2.01)^2 + (1.94)^2]^{1/2}$. 3

b) If $u = \frac{x+y}{1-xy}$, $v = \tan^{-1}x + \tan^{-1}y$ find $\frac{\partial(u, v)}{\partial(x, y)}$. 3

c) Examine the function $f(x, y) = y^2 + 4xy + 3x^2 + x^3$ for extreme values. 4



Seat No.	
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F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct option :

14

- 1) The imaginary part of $\cos h(x + iy)$ is
 - a) $\sin x \sin hy$
 - b) $-\sin x \sin hy$
 - c) $\sin hx \sin y$
 - d) $\sin hx \sin hy$
- 2) The argument of complex number $(1 - \cos \alpha) + i \sin \alpha$ is
 - a) $\frac{\pi}{4} - \frac{\alpha}{2}$
 - b) $\frac{\pi}{2} - \alpha$
 - c) $\frac{\pi}{2} - \frac{\alpha}{2}$
 - d) $\frac{\pi}{2} - \frac{\alpha}{4}$
- 3) The real part of $e^{5+i\frac{\pi}{2}}$ is
 - a) ie^5
 - b) $-ie^5$
 - c) e^5
 - d) None
- 4) The rank of the matrix $\begin{bmatrix} 555 & 666 & 888 \\ 555 & 666 & 888 \\ 555 & 666 & 888 \end{bmatrix}$ is
 - a) 0
 - b) 1
 - c) 2
 - d) 3
- 5) The system $3x + 4y + 2z = 4$, $9x + 12z = 12$ has
 - a) Infinitely many solutions
 - b) No solution
 - c) Unique solution
 - d) Linearly independent solutions



- 6) If 2, 3, 4 are the eigen values of A, then determinant of A is equal to
- a) 9 b) $\frac{1}{9}$ c) 24 d) $\frac{1}{24}$
- 7) If $X_1, X_2, X_3, \dots, X_n$ are linearly dependent vectors, then the vectors X_1, X_2, \dots, X_{n-1} are
- a) Linearly dependent b) All zero
c) All equal d) Linearly independent
- 8) If $f(x) = \log(x \tan^{-1}y)$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to
- a) $-\frac{1}{x^2}$ b) 0
c) $\frac{1}{x}$ d) $\frac{1}{x^2}$
- 9) If $u = \frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}}$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$
- a) 4u b) 5u
c) 20u d) $\frac{u}{20}$
- 10) If $u = x^2 + y^2$, then the approximate value of u when $x = 1.1$ and $y = 2.1$ is
- a) 5.6 b) $(1.1)^2$
c) $(2.1)^2$ d) 4.3
- 11) The constant term in the expansion of $\log(1 + \sin x)$ is
- a) 1 b) -1 c) $\frac{1}{2}$ d) 0
- 12) If $y = (-2)^x$ then $y_n =$
- a) $2^n (-2)^x$ b) $2^n (\log 2)^x$ c) $-(2)^n (-2)^x$ d) None of these
- 13) If $y = \cos^2 x$ then $y_n =$
- a) $2^n \cos\left(2x + \frac{n\pi}{2}\right)$ b) $2^{n-1} \cos\left(2x + \frac{n\pi}{2}\right)$
c) $2 \cos\left(2x + \frac{n\pi}{2}\right)$ d) None
- 14) The hyperbolic sech (ix) is
- a) $\sec x$ b) $i \sec x$
c) $-\sec x$ d) None of these



Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.

SECTION – I

2. a) If $\sin((\theta + i\theta) = \rho(\cos \alpha + i \sin \alpha)$, prove $\rho^2 = \frac{1}{2} [\cosh 2\phi - \cos 2\theta]$. **3**
- b) If $\log(x + iy) = e^p + iq$ prove that $y = x \tan \theta$ where $2\theta = \tan q \log(x^2 + y^2)$. **3**
- c) Prove that $\tan^{-1}(\sin \theta) = \cosh^{-1}(\sec \theta)$. **3**
3. a) If $x_r = \cos \frac{\pi}{3^r} + i \sin \frac{\pi}{3^r}$ prove that $x_1, x_2 \dots x_\infty = i$. **3**
- b) Express $\cos 8\theta$ in powers of $\sin \theta$ and $\cos \theta$. **3**
- c) Find the roots of $x^5 = 1 + i$. **3**
4. a) If $y = \frac{x^4}{(x-1)(x-2)}$ find y_n . **3**
- b) If $y = e^{2x} \sin \frac{x}{2} \cos \frac{3x}{2}$ find y_n . **3**
- c) If $x = e^t$ and $y = \cos mt$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+m^2)y_n = 0$. **(3+1=4)**
5. a) Prove that $\sin(e^x - 1) = x + \frac{x^2}{2} - \frac{5}{24}x^4 + \dots$ **3**
- b) Expand $f(x) = x^3 + 3x^2 + 15x - 10$ in powers of $(x - 1)$ and hence find $f\left(\frac{11}{10}\right)$. **3**
- c) Evaluate $\lim_{x \rightarrow 1} \left[\frac{1}{\log x} - \frac{x}{x-1} \right]$. **3**
- OR
- c) Expand $\log(\sec x + \tan x)$ by using Maclaurin's theorem upto power x^3 . **3**



SECTION – II

6. Attempt the following :

a) Find the rank of the following matrix by reducing it to normal form $A = \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$. 3

b) Test the consistency and hence solve the following set of equation

$$x_1 + 2x_2 + x_3 = 2$$

$$3x_1 + x_2 - 2x_3 = 1$$

$$4x_1 - 3x_2 - x_3 = 3$$

$$2x_1 + 4x_2 + 2x_3 = 4$$

3

c) Find the values of k such that the system of equations

$$x + ky + 3z = 0$$

$$4x + 3y + kz = 0$$

$$2x + y + 2z = 0 \text{ has non-trivial solution.}$$

3

7. Attempt the following :

a) Examine for linear independent the following set of vectors

$$[2, -1, 4], [0, 1, 2], [6, -1, 16], [4, 0, 12].$$

3

b) Find all the eigen values and eigen vector corresponding to the largest eigen value

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

3

c) Find the characteristic equation of the matrix A given below and hence, find the matrix

represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. 3

8. Attempt the following :

a) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$. 5

b) If $u = \tan^{-1} \left[\frac{x^3 + y^3}{2x + 3y} \right]$, prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \sin 4u = \sin 2u$. 4

9. Attempt the following :

a) Find approximate value of $[(0.98)^2 + (2.01)^2 + (1.94)^2]^{1/2}$. 3

b) If $u = \frac{x+y}{1-xy}$, $v = \tan^{-1}x + \tan^{-1}y$ find $\frac{\partial(u, v)}{\partial(x, y)}$. 3

c) Examine the function $f(x, y) = y^2 + 4xy + 3x^2 + x^3$ for extreme values. 4



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F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct option :

14

- 1) If 2, 3, 4 are the eigen values of A, then determinant of A is equal to
a) 9 b) $\frac{1}{9}$ c) 24 d) $\frac{1}{24}$
- 2) If $X_1, X_2, X_3, \dots, X_n$ are linearly dependent vectors, then the vectors X_1, X_2, \dots, X_{n-1} are
a) Linearly dependent b) All zero
c) All equal d) Linearly independent
- 3) If $f(x) = \log(x \tan^{-1}y)$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to
a) $-\frac{1}{x^2}$ b) 0
c) $\frac{1}{x}$ d) $\frac{1}{x^2}$
- 4) If $u = \frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}}$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$
a) 4u b) 5u
c) 20u d) $\frac{u}{20}$



Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
ENGINEERING MATHEMATICS – I**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Attempt **any three** questions from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.

SECTION – I

2. a) If $\sin((\theta + i\theta) = \rho(\cos \alpha + i \sin \alpha)$, prove $\rho^2 = \frac{1}{2} [\cosh 2\phi - \cos 2\theta]$. **3**
- b) If $\log(x + iy) = e^p + iq$ prove that $y = x \tan \theta$ where $2\theta = \tan q \log(x^2 + y^2)$. **3**
- c) Prove that $\tan^{-1}(\sin \theta) = \cosh^{-1}(\sec \theta)$. **3**
3. a) If $x_r = \cos \frac{\pi}{3^r} + i \sin \frac{\pi}{3^r}$ prove that $x_1, x_2 \dots x_\infty = i$. **3**
- b) Express $\cos 8\theta$ in powers of $\sin \theta$ and $\cos \theta$. **3**
- c) Find the roots of $x^5 = 1 + i$. **3**
4. a) If $y = \frac{x^4}{(x-1)(x-2)}$ find y_n . **3**
- b) If $y = e^{2x} \sin \frac{x}{2} \cos \frac{3x}{2}$ find y_n . **3**
- c) If $x = e^t$ and $y = \cos mt$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+m^2)y_n = 0$. **(3+1=4)**
5. a) Prove that $\sin(e^x - 1) = x + \frac{x^2}{2} - \frac{5}{24}x^4 + \dots$ **3**
- b) Expand $f(x) = x^3 + 3x^2 + 15x - 10$ in powers of $(x - 1)$ and hence find $f\left(\frac{11}{10}\right)$. **3**
- c) Evaluate $\lim_{x \rightarrow 1} \left[\frac{1}{\log x} - \frac{x}{x-1} \right]$. **3**
- OR
- c) Expand $\log(\sec x + \tan x)$ by using Maclaurins theorem upto power x^3 . **3**



SECTION – II

6. Attempt the following :

a) Find the rank of the following matrix by reducing it to normal form $A = \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$. 3

b) Test the consistency and hence solve the following set of equation

$$x_1 + 2x_2 + x_3 = 2$$

$$3x_1 + x_2 - 2x_3 = 1$$

$$4x_1 - 3x_2 - x_3 = 3$$

$$2x_1 + 4x_2 + 2x_3 = 4$$

3

c) Find the values of k such that the system of equations

$$x + ky + 3z = 0$$

$$4x + 3y + kz = 0$$

$$2x + y + 2z = 0 \text{ has non-trivial solution.}$$

3

7. Attempt the following :

a) Examine for linear independent the following set of vectors

$$[2, -1, 4], [0, 1, 2], [6, -1, 16], [4, 0, 12].$$

3

b) Find all the eigen values and eigen vector corresponding to the largest eigen value

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

3

c) Find the characteristic equation of the matrix A given below and hence, find the matrix

represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. 3

8. Attempt the following :

a) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$. 5

b) If $u = \tan^{-1} \left[\frac{x^3 + y^3}{2x + 3y} \right]$, prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \sin 4u = \sin 2u$. 4

9. Attempt the following :

a) Find approximate value of $[(0.98)^2 + (2.01)^2 + (1.94)^2]^{1/2}$. 3

b) If $u = \frac{x+y}{1-xy}$, $v = \tan^{-1}x + \tan^{-1}y$ find $\frac{\partial(u, v)}{\partial(x, y)}$. 3

c) Examine the function $f(x, y) = y^2 + 4xy + 3x^2 + x^3$ for extreme values. 4



SLR-EP – 7

Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
 - 4) In Section – II, solve **any three** questions.
 - 5) **Assume** suitable data if **necessary** and state it **clearly**.
 - 6) **Use** of non programmable scientific calculators is **allowed**.
 - 7) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) If the size of the object is small compared to other distances involved in the problem, it may be treated as _____
a) body b) object c) particle d) matter
- 2) Equilibrant is _____ as the resultant in magnitude but its direction is _____ to that of resultant.
a) twice, same b) half, opposite
c) same, opposite d) opposite, same
- 3) If a body is in equilibrium under the action of only three forces, they should be
a) parallel b) concurrent c) non-concurrent d) colinear
- 4) A simply supported beam AB is subjected to point load of 100 kN at its centre reactions R_A and R_B will be equal to
a) 100, 100 kN b) 50, 50 kN c) 60, 40 kN d) 40, 60 kN

P.T.O.



- 5) Polar moment of inertia is related with _____ axis theorem.
a) perpendicular b) parallel c) both a) and b) d) none
- 6) Moment of inertia of a rectangle with width b, about its base is equal to
a) $\frac{bd^3}{12}$ b) $\frac{db^3}{12}$ c) $\frac{bd^3}{3}$ d) $\frac{db^3}{3}$
- 7) A frame is said to be _____, if the number of members in it are more than that required for a perfect frame.
a) redundant b) deficient c) both a) and b) d) none
- 8) Maximum range of projectile is obtained when angle of projection is _____ degree.
a) 90 b) 45 c) 75 d) 30
- 9) In projectile motion, which of the following quantity remains constant ?
a) Speed b) Y component of velocity
c) X component of velocity d) none of the above
- 10) Work energy principle relates
a) force time displacement b) force velocity time
c) force displacement velocity d) force mass acceleration
- 11) When a ball is thrown up with a velocity 'u', the maximum height reached by particle is
a) $u^2/2g$ b) $2u^2/g$ c) $2u/g$ d) u/g
- 12) The acceleration of particle is given by equation $a = 2t - 10$. If initial velocity of particle is 10 m/s what will be the velocity of the particle after 1 second from start
a) 2 m/s b) 1 m/s c) 12 m/s d) 18 m/s
- 13) Direction of velocity and acceleration in a rectilinear motion are
a) same b) opposite c) collinear d) none of the above
- 14) When body is lifted up, work done by force of gravity is _____
a) +ve b) zero c) -ve d) none
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Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
2) In Section – II, solve **any three** questions.
3) **Assume** suitable data if necessary and state it **clearly**.
4) **Use** of non programmable scientific calculators is **allowed**.
5) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) State and prove Varignon's theorem. 4
b) Determine the magnitude of the resultant of the four forces acting on a body as shown in Fig. 1. Also find its direction and position from point 'O'. 6

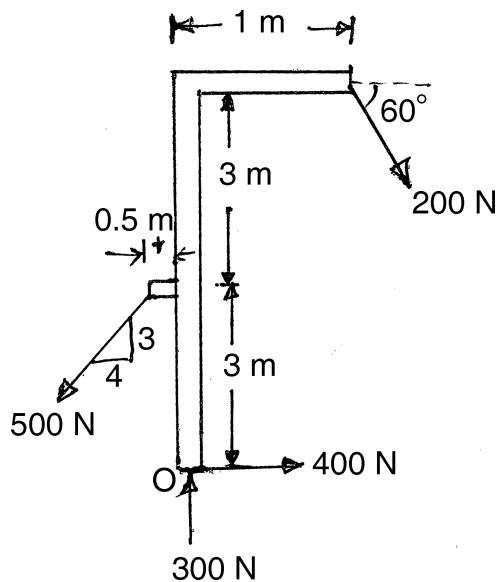


Fig. 1



3. a) State laws of friction. 3
- b) What should be the value of θ in Fig. 2, that will make the motion of 900 kN block down the plane to impend? The coefficient of friction for all contact surfaces is $\frac{1}{3}$. 6

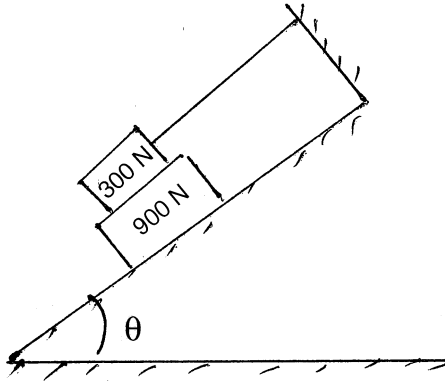


Fig. 2

4. a) State principle of virtual work. 2
- b) Analyse the following truss and find forces in any four members. Use any method. 7

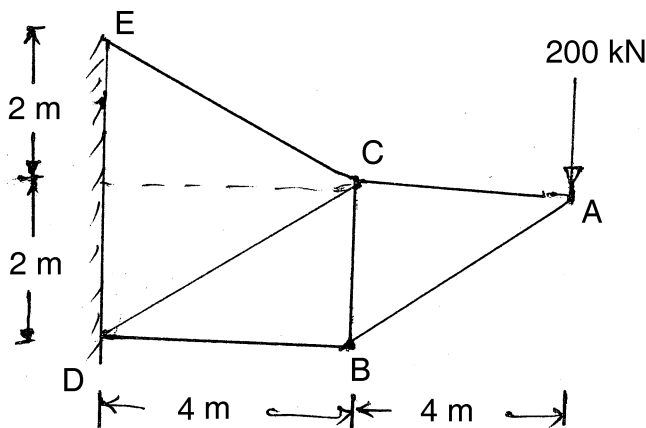


Fig. 3



5. a) Define polar moment of inertia. 2
b) Determine the moment of inertia of the shaded area as shown in fig. 4 about centroidal axis parallel to AB. 7

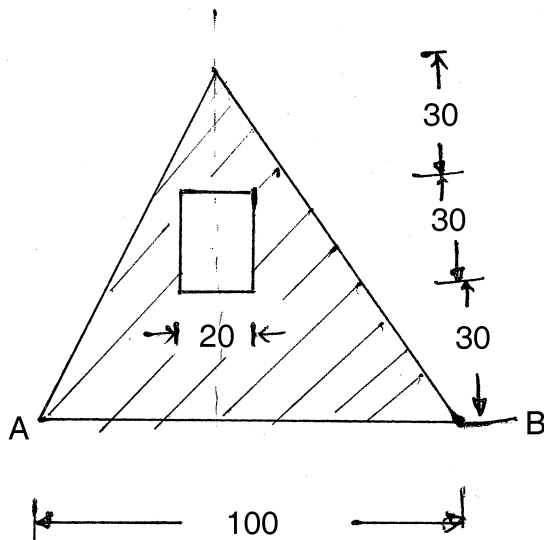


Fig. 4

SECTION – II

6. a) Define and explain concept of relative velocity. 3
b) A stone is thrown vertically upwards with an initial velocity u . Determine
i) Maximum height attained by stone
ii) Time of flight in the air and
iii) The velocity with which it strikes the ground back. 7
7. a) Explain concept of dynamic equilibrium. 2
b) Two bodies of weights 15 N and 3 N are connected to the two ends of a light intensible string. Passing over a smooth pulley. The weight 15 N is placed on rough horizontal surface while the weight 3 N is hanging vertically in air. Initially the friction between the weight of 15 N and table is just sufficient to prevent motion. If additional weight of 0.5 N is added to weight 3 N. Determine 7



- i) The acceleration of the weights and
- ii) Tension in the string after adding weight of 0.5 N to the weight 3 N. Take $g = 9.8 \text{ m/s}^2$ for details refer Fig. 5.

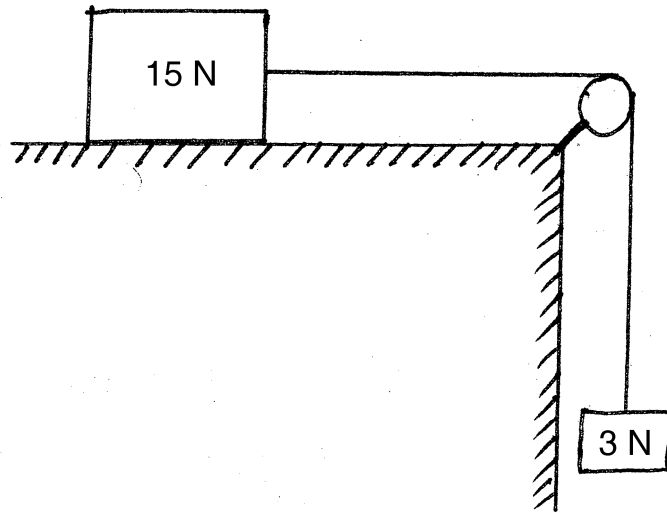


Fig. 5

8. a) Write the condition of maximum range in case of a projectile motion. 2
- b) A man throws an iron ball with an initial velocity of 13 m/sec. What should be angle of projection if he has to reach a record of maximum height of 9 m from ground. Take height from which ball is released as 1.2 m. 7
9. a) Explain work-energy principle. 2
- b) A body weighing 300 N is pushed up a 30° plane by 400 N force acting parallel to the plane. If the initial velocity of the body is 2 m/s and coefficient of kinetic friction is $\mu = 0.25$, what velocity will the body have after moving 5 m ? 7



SLR-EP – 7

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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
 - 4) In Section – II, solve **any three** questions.
 - 5) **Assume** suitable data if **necessary** and state it **clearly**.
 - 6) **Use** of non programmable scientific calculators is **allowed**.
 - 7) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Maximum range of projectile is obtained when angle of projection is _____ degree.
a) 90 b) 45 c) 75 d) 30
- 2) In projectile motion, which of the following quantity remains constant ?
a) Speed b) Y component of velocity
c) X component of velocity d) none of the above
- 3) Work energy principle relates
a) force time displacement b) force velocity time
c) force displacement velocity d) force mass acceleration
- 4) When a ball is thrown up with a velocity 'u', the maximum height reached by particle is
a) $u^2/2g$ b) $2u^2/g$ c) $2u/g$ d) u/g

P.T.O.



- 5) The acceleration of particle is given by equation $a = 2t - 10$. If initial velocity of particle is 10 m/s what will be the velocity of the particle after 1 second from start
- a) 2 m/s b) 1 m/s c) 12 m/s d) 18 m/s
- 6) Direction of velocity and acceleration in a rectilinear motion are
- a) same b) opposite c) collinear d) none of the above
- 7) When body is lifted up, work done by force of gravity is _____
- a) +ve b) zero c) -ve d) none
- 8) If the size of the object is small compared to other distances involved in the problem, it may be treated as _____
- a) body b) object c) particle d) matter
- 9) Equilibrant is _____ as the resultant in magnitude but its direction is _____ to that of resultant.
- a) twice, same b) half, opposite
c) same, opposite d) opposite, same
- 10) If a body is in equilibrium under the action of only three forces, they should be
- a) parallel b) concurrent c) non-concurrent d) colinear
- 11) A simply supported beam AB is subjected to point load of 100 kN at its centre reactions R_A and R_B will be equal to
- a) 100, 100 kN b) 50, 50 kN c) 60, 40 kN d) 40, 60 kN
- 12) Polar moment of inertia is related with _____ axis theorem.
- a) perpendicular b) parallel c) both a) and b) d) none
- 13) Moment of inertia of a rectangle with width b, about its base is equal to
- a) $\frac{bd^3}{12}$ b) $\frac{db^3}{12}$ c) $\frac{bd^3}{3}$ d) $\frac{db^3}{3}$
- 14) A frame is said to be _____, if the number of members in it are more than that required for a perfect frame.
- a) redundant b) deficient c) both a) and b) d) none
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Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
2) In Section – II, solve **any three** questions.
3) **Assume** suitable data if necessary and state it **clearly**.
4) **Use** of non programmable scientific calculators is **allowed**.
5) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) State and prove Varignon's theorem. 4
b) Determine the magnitude of the resultant of the four forces acting on a body as shown in Fig. 1. Also find its direction and position from point 'O'. 6

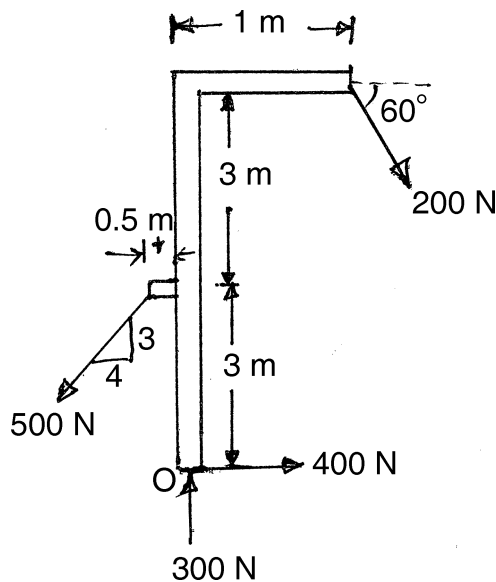


Fig. 1



3. a) State laws of friction. 3
- b) What should be the value of θ in Fig. 2, that will make the motion of 900 kN block down the plane to impend? The coefficient of friction for all contact surfaces is $\frac{1}{3}$. 6

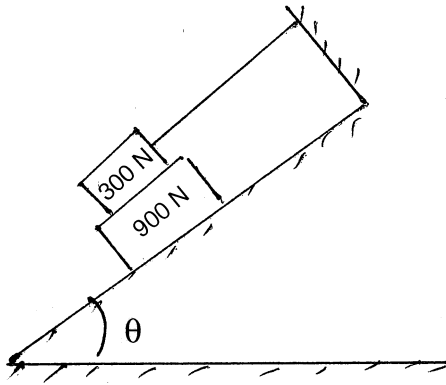


Fig. 2

4. a) State principle of virtual work. 2
- b) Analyse the following truss and find forces in any four members. Use any method. 7

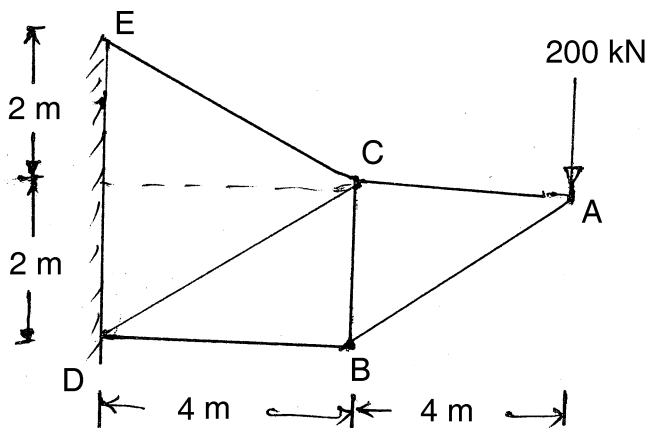


Fig. 3



5. a) Define polar moment of inertia. 2
b) Determine the moment of inertia of the shaded area as shown in fig. 4 about centroidal axis parallel to AB. 7

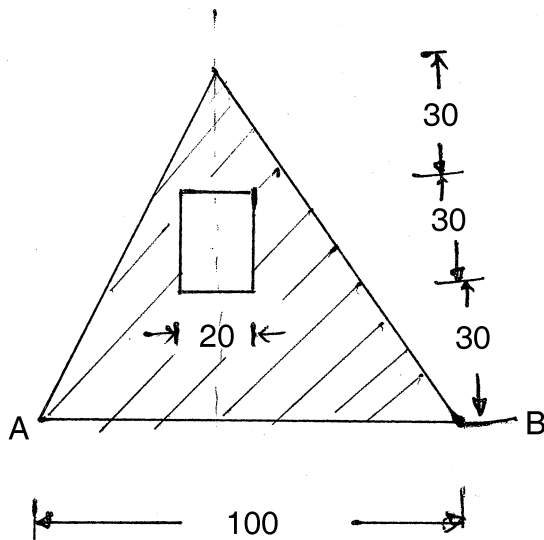


Fig. 4

SECTION – II

6. a) Define and explain concept of relative velocity. 3
b) A stone is thrown vertically upwards with an initial velocity u . Determine
i) Maximum height attained by stone
ii) Time of flight in the air and
iii) The velocity with which it strikes the ground back. 7
7. a) Explain concept of dynamic equilibrium. 2
b) Two bodies of weights 15 N and 3 N are connected to the two ends of a light intensible string. Passing over a smooth pulley. The weight 15 N is placed on rough horizontal surface while the weight 3 N is hanging vertically in air. Initially the friction between the weight of 15 N and table is just sufficient to prevent motion. If additional weight of 0.5 N is added to weight 3 N. Determine 7



- i) The acceleration of the weights and
- ii) Tension in the string after adding weight of 0.5 N to the weight 3 N. Take $g = 9.8 \text{ m/s}^2$ for details refer Fig. 5.

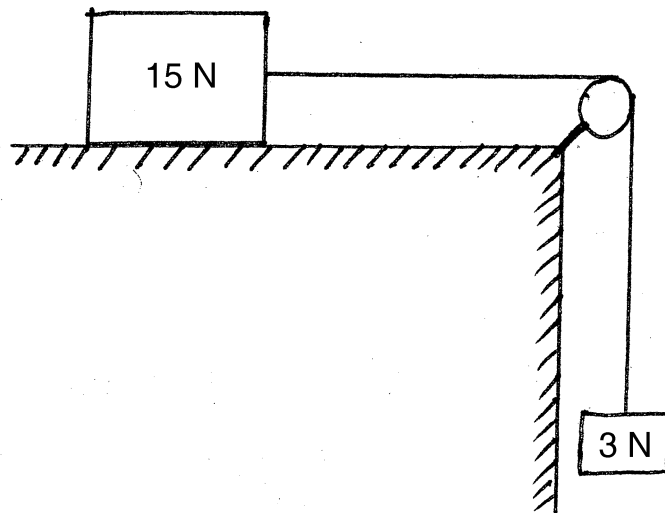


Fig. 5

8. a) Write the condition of maximum range in case of a projectile motion. 2
- b) A man throws an iron ball with an initial velocity of 13 m/sec. What should be angle of projection if he has to reach a record of maximum height of 9 m from ground. Take height from which ball is released as 1.2 m. 7
9. a) Explain work-energy principle. 2
- b) A body weighing 300 N is pushed up a 30° plane by 400 N force acting parallel to the plane. If the initial velocity of the body is 2 m/s and coefficient of kinetic friction is $\mu = 0.25$, what velocity will the body have after moving 5 m ? 7



SLR-EP – 7

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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
 - 4) In Section – II, solve **any three** questions.
 - 5) **Assume** suitable data if **necessary** and state it **clearly**.
 - 6) **Use** of non programmable scientific calculators is **allowed**.
 - 7) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Polar moment of inertia is related with _____ axis theorem.
a) perpendicular b) parallel c) both a) and b) d) none
- 2) Moment of inertia of a rectangle with width b, about its base is equal to
a) $\frac{bd^3}{12}$ b) $\frac{db^3}{12}$
c) $\frac{bd^3}{3}$ d) $\frac{db^3}{3}$
- 3) A frame is said to be _____, if the number of members in it are more than that required for a perfect frame.
a) redundant b) deficient c) both a) and b) d) none
- 4) Maximum range of projectile is obtained when angle of projection is _____ degree.
a) 90 b) 45 c) 75 d) 30

P.T.O.



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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
2) In Section – II, solve **any three** questions.
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4) **Use** of non programmable scientific calculators is **allowed**.
5) Figures to the **right** indicate **full** marks.

SECTION – I

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b) Determine the magnitude of the resultant of the four forces acting on a body as shown in Fig. 1. Also find its direction and position from point 'O'. 6

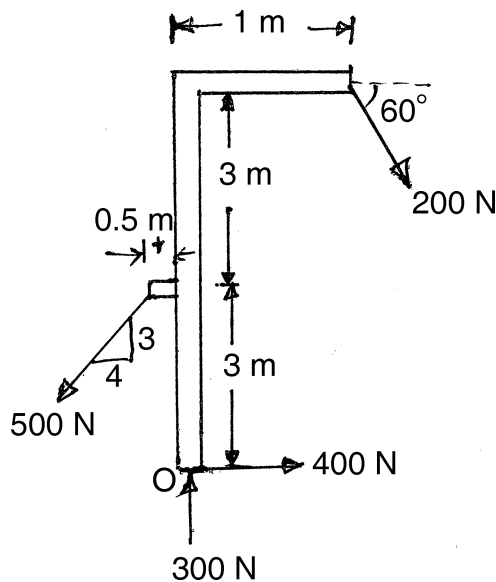


Fig. 1



3. a) State laws of friction. 3
- b) What should be the value of θ in Fig. 2, that will make the motion of 900 kN block down the plane to impend? The coefficient of friction for all contact surfaces is $\frac{1}{3}$. 6

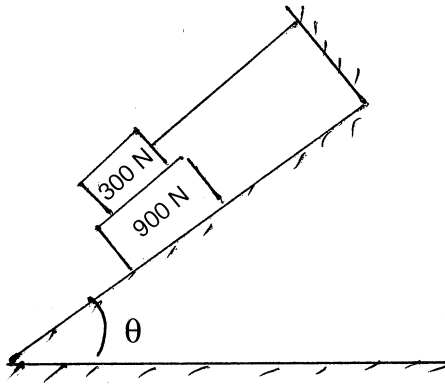


Fig. 2

4. a) State principle of virtual work. 2
- b) Analyse the following truss and find forces in any four members. Use any method. 7

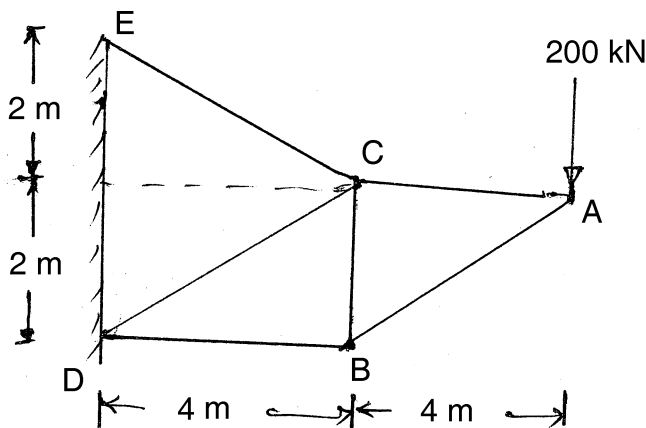


Fig. 3



5. a) Define polar moment of inertia. 2
b) Determine the moment of inertia of the shaded area as shown in fig. 4 about centroidal axis parallel to AB. 7

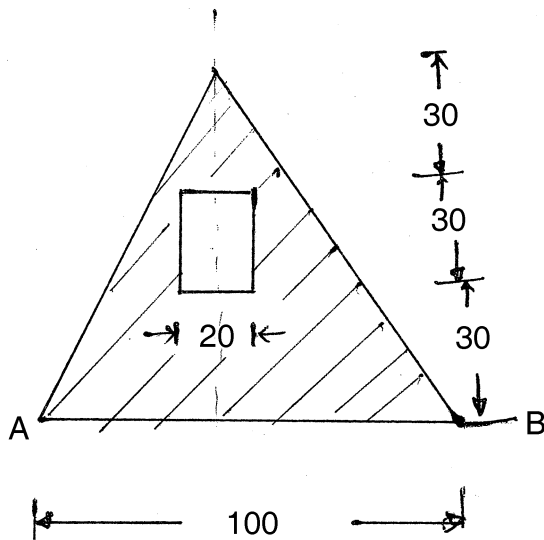


Fig. 4

SECTION – II

6. a) Define and explain concept of relative velocity. 3
b) A stone is thrown vertically upwards with an initial velocity u . Determine
i) Maximum height attained by stone
ii) Time of flight in the air and
iii) The velocity with which it strikes the ground back. 7
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- i) The acceleration of the weights and
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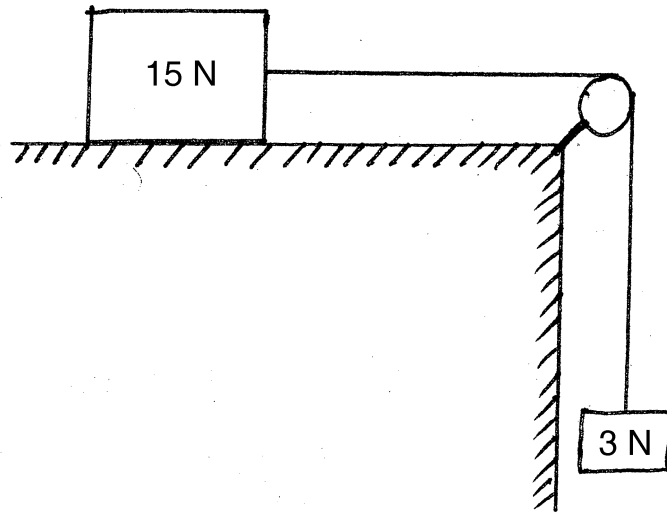


Fig. 5

8. a) Write the condition of maximum range in case of a projectile motion. 2
- b) A man throws an iron ball with an initial velocity of 13 m/sec. What should be angle of projection if he has to reach a record of maximum height of 9 m from ground. Take height from which ball is released as 1.2 m. 7
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- b) A body weighing 300 N is pushed up a 30° plane by 400 N force acting parallel to the plane. If the initial velocity of the body is 2 m/s and coefficient of kinetic friction is $\mu = 0.25$, what velocity will the body have after moving 5 m ? 7



SLR-EP – 7

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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
 - 4) In Section – II, solve **any three** questions.
 - 5) **Assume** suitable data if **necessary** and state it **clearly**.
 - 6) **Use** of non programmable scientific calculators is **allowed**.
 - 7) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Work energy principle relates
 - a) force time displacement
 - b) force velocity time
 - c) force displacement velocity
 - d) force mass acceleration
- 2) When a ball is thrown up with a velocity 'u', the maximum height reached by particle is
 - a) $u^2/2g$
 - b) $2u^2/g$
 - c) $2u/g$
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- 3) The acceleration of particle is given by equation $a = 2t - 10$. If initial velocity of particle is 10 m/s what will be the velocity of the particle after 1 second from start
 - a) 2 m/s
 - b) 1 m/s
 - c) 12 m/s
 - d) 18 m/s
- 4) Direction of velocity and acceleration in a rectilinear motion are
 - a) same
 - b) opposite
 - c) collinear
 - d) none of the above

P.T.O.



- 5) When body is lifted up, work done by force of gravity is _____
a) +ve b) zero c) – ve d) none
- 6) If the size of the object is small compared to other distances involved in the problem, it may be treated as _____
a) body b) object c) particle d) matter
- 7) Equilibrant is _____ as the resultant in magnitude but its direction is _____ to that of resultant.
a) twice, same b) half, opposite
c) same, opposite d) opposite, same
- 8) If a body is in equilibrium under the action of only three forces, they should be
a) parallel b) concurrent c) non-concurrent d) colinear
- 9) A simply supported beam AB is subjected to point load of 100 kN at its centre reactions R_A and R_B will be equal to
a) 100, 100 kN b) 50, 50 kN c) 60, 40 kN d) 40, 60 kN
- 10) Polar moment of inertia is related with _____ axis theorem.
a) perpendicular b) parallel c) both a) and b) d) none
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a) $\frac{bd^3}{12}$ b) $\frac{db^3}{12}$ c) $\frac{bd^3}{3}$ d) $\frac{db^3}{3}$
- 12) A frame is said to be _____, if the number of members in it are more than that required for a perfect frame.
a) redundant b) deficient c) both a) and b) d) none
- 13) Maximum range of projectile is obtained when angle of projection is _____ degree.
a) 90 b) 45 c) 75 d) 30
- 14) In projectile motion, which of the following quantity remains constant ?
a) Speed b) Y component of velocity
c) X component of velocity d) none of the above
-



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**F.E. (Part – I) (Old – CGPA) Examination, 2016
APPLIED MECHANICS**

Day and Date : Wednesday, 14-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) In Section – I, Q. No. 2 is **compulsory**. Solve **any two** from the **remaining**.
 - 2) In Section – II, solve **any three** questions.
 - 3) **Assume** suitable data if necessary and state it **clearly**.
 - 4) **Use** of non programmable scientific calculators is **allowed**.
 - 5) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) State and prove Varignon's theorem. 4
- b) Determine the magnitude of the resultant of the four forces acting on a body as shown in Fig. 1. Also find its direction and position from point 'O'. 6

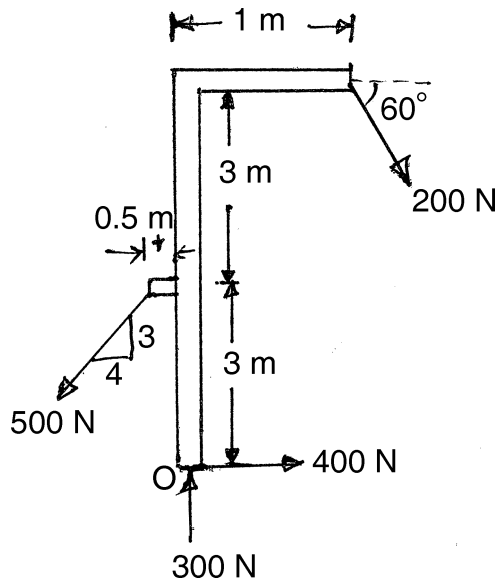


Fig. 1



3. a) State laws of friction. 3
- b) What should be the value of θ in Fig. 2, that will make the motion of 900 kN block down the plane to impend? The coefficient of friction for all contact surfaces is $\frac{1}{3}$. 6

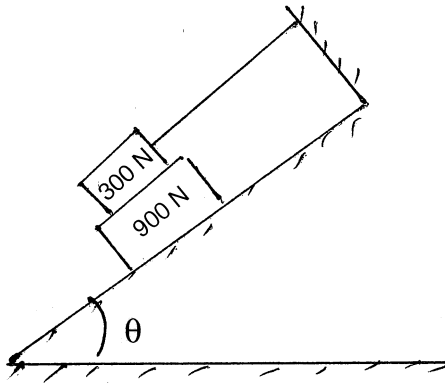


Fig. 2

4. a) State principle of virtual work. 2
- b) Analyse the following truss and find forces in any four members. Use any method. 7

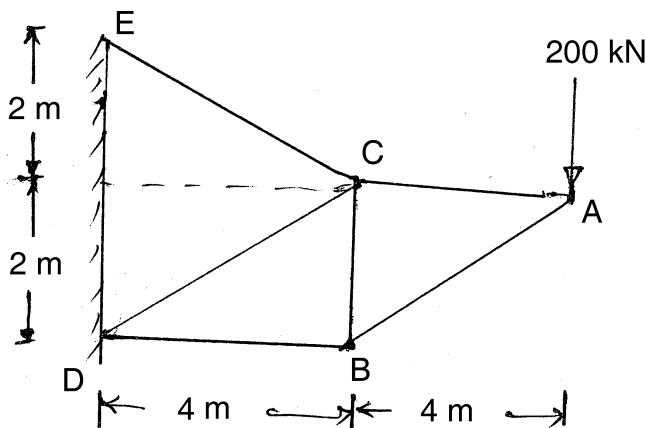


Fig. 3



5. a) Define polar moment of inertia. 2
b) Determine the moment of inertia of the shaded area as shown in fig. 4 about centroidal axis parallel to AB. 7

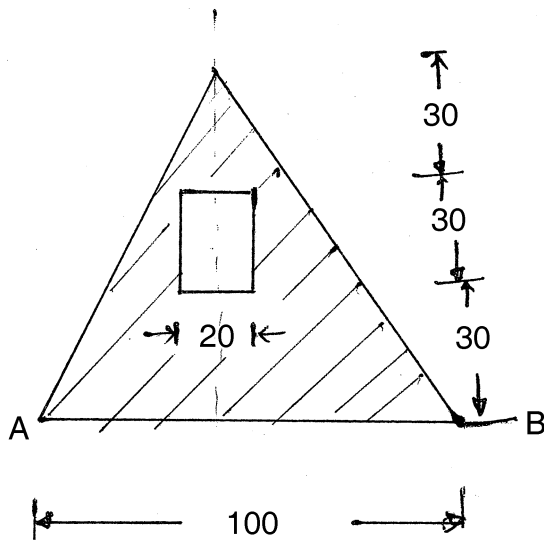


Fig. 4

SECTION – II

6. a) Define and explain concept of relative velocity. 3
b) A stone is thrown vertically upwards with an initial velocity u . Determine
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- i) The acceleration of the weights and
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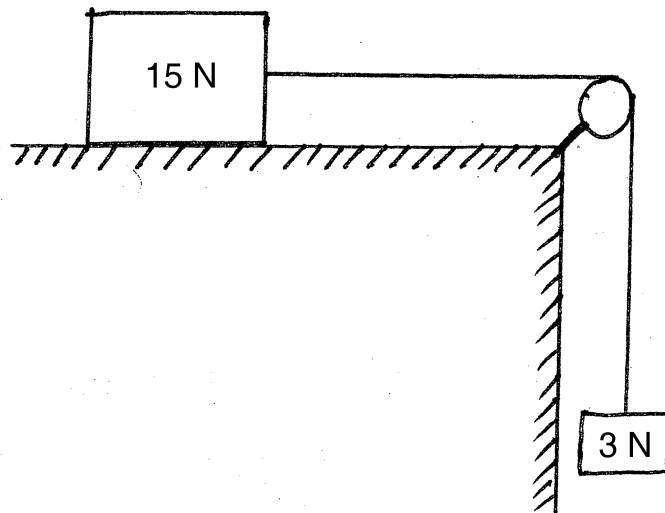


Fig. 5

8. a) Write the condition of maximum range in case of a projectile motion. 2
- b) A man throws an iron ball with an initial velocity of 13 m/sec. What should be angle of projection if he has to reach a record of maximum height of 9 m from ground. Take height from which ball is released as 1.2 m. 7
9. a) Explain work-energy principle. 2
- b) A body weighing 300 N is pushed up a 30° plane by 400 N force acting parallel to the plane. If the initial velocity of the body is 2 m/s and coefficient of kinetic friction is $\mu = 0.25$, what velocity will the body have after moving 5 m ? 7



SLR-EP – 8

Seat No.	
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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) **All** questions are **compulsory**.
 - 4) Assume suitable data if **necessary**.
 - 5) Draw **neat** diagrams **whenever** necessary.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) What percentage of the maximum power is delivered to a load if load resistance is 10 times greater than the Thevenins resistance of the source to which it is connected ?
a) 25% b) 50% c) 35% d) 33.06%
- 2) Three 3Ω resistors are connected in the form of equilateral triangle. The total resistance between any two corners is
a) 2Ω b) 6Ω c) 3Ω d) $4/3\Omega$
- 3) The commercial unit of electrical energy is
a) K WH b) Joule c) Watt-second d) None of these
- 4) A magnetizing force of 800 AT/m will produce a flux density of _____ in air.
a) 1 m Wb/m^2 b) 1 Wb/m^2 c) 10 m Wb/m^2 d) 0.5 Wb/m^2
- 5) The value of leakage co-efficient for electrical machines is usually about
a) 0.5 to 1 b) 4 to 10 c) above 10 d) 1.15 to 1.25

P.T.O.



- 6) Two sinusoidal currents are given by the equations ; $i_1 = 10 \sin (\omega t + \pi/3)$ and $i_2 = 15 \sin (\omega t - \pi/4)$. The phase difference between them is _____ degrees.
- a) 105 b) 75 c) 15 d) 60
- 7) The r.m.s. value of sinusoidal ac current is equal to its value at an angle of _____ degree.
- a) 60 b) 45 c) 20 d) 90
- 8) A transformer having 1000 primary turns is connected to a 250 V ac supply. For a secondary voltage of 400 V, the number of secondary turns should be
- a) 1600 b) 400 c) 250 d) 1250
- 9) In a balanced star connected system line voltages lead their respective phase voltages by
- a) 120° b) 30° c) 60° d) 45°
- 10) One of the characteristics of a single phase motor is that it
- a) is self-starting b) is not self-starting
c) requires one winding d) none of above
- 11) A step up transformer increases
- a) power b) current c) voltage d) frequency
- 12) In purely resistive circuit the power factor is
- a) zero b) zero leading
c) zero lagging d) none of the above
- 13) In star connected balanced load
- a) $I_L = I_{PH}$ b) $V_L = V_{PH}$
c) $I_L = \sqrt{3} I_{PH}$ d) None of the above
- 14) If the admittance of parallel AC circuit is increased, the circuit current
- a) remain constant b) is decreased
c) is increased d) none of the above



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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) *All questions are compulsory.*
2) *Assume suitable data if necessary.*
3) *Draw neat diagrams whenever necessary.*

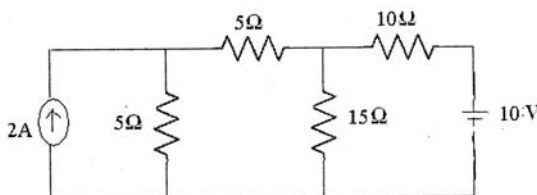
SECTION – I

2. Attempt **any four** of the following : (4×4=16)

- a) A d.c. shunt motor after running several hours on constant voltage mains 400 V takes a field current of 1.6 A. If the temperature rise is known to be 40° C, what value of extra circuit resistance is required to adjust the field current to 1.6 A when starting from cold at 20°C? Temperature coefficient = 0.0043/°C at 20° C.
- b) Write short notes on : “B-H Curve and effect on selection of Electromagnetic material”.
- c) State Thevenin’s theorem and explain procedure for finding current flowing through RL.
- d) Define and explain following terms :
 - i) Magnetic field strength
 - ii) Form Factor
 - iii) Phasor Diagram
 - iv) Phase
- e) An electric kettle containing 0.75 liters of water raises the temperature from 30° to boiling point using 0.5 KW power from 240 V d.c. supplies. If overall efficiency is 80%, find the time required (in minutes) to raise the above temperature. Take specific heat of water as 4,200 J/kg k.
- f) The self-inductance of a coil having 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10,000 turns, Calculate :
 - 1) Mutual Inductance of the two coil
 - 2) Emf induced in second coil when current in the first coil changes at the rate of 100 A/sec.

3. Solve **any two** : (2×6=12)

- a) Write the properties of series and parallel D.C. circuits. Find the current flowing through the resistance of 15 Ω .





- b) A metal ring of mean diameter of 80 cm is made out of two semi-circular pieces of cast iron and cast steel separate at a junction of pieces of copper each of 1 millimeter thickness. If the ring is uniformly wound with 100 turns, calculate the value of the current required to produce a flux density of 0.85 T in the ring. Given that relative permeability of cast iron is 200, and that of cast steel is of 1,200.
- c) Define average value and prove that average value of an alteration quantity over a complete cycle is zero.

SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Derive the expression of average power in purely resistive AC circuit.
- b) Define and explain following terms related to ac circuit :
- 1) Impedance 2) Admittance 3) Active power 4) Power factor
- c) Derive an e.m.f. equation for a single phase transformer.
- d) State various applications of DC shunt and DC series motor.
- e) Derive the relationship between line and phase quantities of star connected load.
- f) With the help of waveforms and phasor diagram explain AC through series RL circuit.
5. Solve **any two** : **(2×6=12)**
- a) A single phase. 220 V/110 V, 5 KVA transformer has an efficiency of 96% on full load at unity power factor and 95% on half load at unity power factor. Determine for full load condition.
- 1) Iron and copper loss 2) Efficiency at 0.8 of lagging
- b) A capacitor of 79.5 μ F is connected in series with a pure resistance of 30 ohm. The circuit is supplied from 100 V, 50 Hz. Source find
- 1) Impedance
- 2) Current flowing through circuit
- 3) Power factor.
- c) Three equal impedance each of $60\angle 30^\circ$ ohm are connected in delta across three phase, 400 V, 50 Hz. Supply. Calculate :
- 1) line and phase voltage
- 2) line and phase current
- 3) active and reactive power.
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SLR-EP – 8

Seat No.	
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Set	Q
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**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING**

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) **All questions are compulsory.**
 - 4) Assume suitable data if **necessary**.
 - 5) Draw **neat diagrams whenever necessary**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) A transformer having 1000 primary turns is connected to a 250 V ac supply. For a secondary voltage of 400 V, the number of secondary turns should be
a) 1600 b) 400 c) 250 d) 1250
- 2) In a balanced star connected system line voltages lead their respective phase voltages by
a) 120° b) 30° c) 60° d) 45°
- 3) One of the characteristics of a single phase motor is that it
a) is self-starting b) is not self-starting
c) requires one winding d) none of above
- 4) A step up transformer increases
a) power b) current c) voltage d) frequency
- 5) In purely resistive circuit the power factor is
a) zero b) zero leading
c) zero lagging d) none of the above

P.T.O.



- 6) In star connected balanced load
- | | |
|----------------------------|----------------------|
| a) $I_L = I_{PH}$ | b) $V_L = V_{PH}$ |
| c) $I_L = \sqrt{3} I_{PH}$ | d) None of the above |
- 7) If the admittance of parallel AC circuit is increased, the circuit current
- | | |
|--------------------|----------------------|
| a) remain constant | b) is decreased |
| c) is increased | d) none of the above |
- 8) What percentage of the maximum power is delivered to a load if load resistance is 10 times greater than the Thevenins resistance of the source to which it is connected ?
- | | | | |
|--------|--------|--------|-----------|
| a) 25% | b) 50% | c) 35% | d) 33.06% |
|--------|--------|--------|-----------|
- 9) Three 3Ω resistors are connected in the form of equilateral triangle. The total resistance between any two corners is
- | | | | |
|--------------|--------------|--------------|----------------|
| a) 2Ω | b) 6Ω | c) 3Ω | d) $4/3\Omega$ |
|--------------|--------------|--------------|----------------|
- 10) The commercial unit of electrical energy is
- | | | | |
|---------|----------|----------------|------------------|
| a) K WH | b) Joule | c) Watt-second | d) None of these |
|---------|----------|----------------|------------------|
- 11) A magnetizing force of 800 AT/m will produce a flux density of _____ in air.
- | | | | |
|-------------------------|-----------------------|--------------------------|-------------------------|
| a) 1 m Wb/m^2 | b) 1 Wb/m^2 | c) 10 m Wb/m^2 | d) 0.5 Wb/m^2 |
|-------------------------|-----------------------|--------------------------|-------------------------|
- 12) The value of leakage co-efficient for electrical machines is usually about
- | | | | |
|-------------|------------|-------------|-----------------|
| a) 0.5 to 1 | b) 4 to 10 | c) above 10 | d) 1.15 to 1.25 |
|-------------|------------|-------------|-----------------|
- 13) Two sinusoidal currents are given by the equations ; $i_1 = 10 \sin (\omega t + \pi/3)$ and $i_2 = 15 \sin (\omega t - \pi/4)$. The phase difference between them is _____ degrees.
- | | | | |
|--------|-------|-------|-------|
| a) 105 | b) 75 | c) 15 | d) 60 |
|--------|-------|-------|-------|
- 14) The r.m.s. value of sinusoidal ac current is equal to its value at an angle of _____ degree.
- | | | | |
|-------|-------|-------|-------|
| a) 60 | b) 45 | c) 20 | d) 90 |
|-------|-------|-------|-------|



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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Assume suitable data if necessary.**
3) **Draw neat diagrams whenever necessary.**

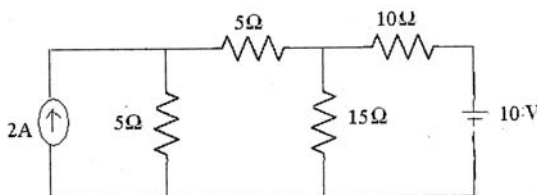
SECTION – I

2. Attempt **any four** of the following : **(4×4=16)**

- a) A d.c. shunt motor after running several hours on constant voltage mains 400 V takes a field current of 1.6 A. If the temperature rise is known to be 40° C, what value of extra circuit resistance is required to adjust the field current to 1.6 A when starting from cold at 20°C? Temperature coefficient = 0.0043/°C at 20° C.
- b) Write short notes on : “B-H Curve and effect on selection of Electromagnetic material”.
- c) State Thevenin’s theorem and explain procedure for finding current flowing through RL.
- d) Define and explain following terms :
 - i) Magnetic field strength
 - ii) Form Factor
 - iii) Phasor Diagram
 - iv) Phase
- e) An electric kettle containing 0.75 liters of water raises the temperature from 30° to boiling point using 0.5 KW power from 240 V d.c. supplies. If overall efficiency is 80%, find the time required (in minutes) to raise the above temperature. Take specific heat of water as 4,200 J/kg k.
- f) The self-inductance of a coil having 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10,000 turns, Calculate :
 - 1) Mutual Inductance of the two coil
 - 2) Emf induced in second coil when current in the first coil changes at the rate of 100 A/sec.

3. Solve **any two** : **(2×6=12)**

- a) Write the properties of series and parallel D.C. circuits. Find the current flowing through the resistance of 15 Ω .





- b) A metal ring of mean diameter of 80 cm is made out of two semi-circular pieces of cast iron and cast steel separate at a junction of pieces of copper each of 1 millimeter thickness. If the ring is uniformly wound with 100 turns, calculate the value of the current required to produce a flux density of 0.85 T in the ring. Given that relative permeability of cast iron is 200, and that of cast steel is of 1,200.
- c) Define average value and prove that average value of an alteration quantity over a complete cycle is zero.

SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Derive the expression of average power in purely resistive AC circuit.
- b) Define and explain following terms related to ac circuit :
- 1) Impedance 2) Admittance 3) Active power 4) Power factor
- c) Derive an e.m.f. equation for a single phase transformer.
- d) State various applications of DC shunt and DC series motor.
- e) Derive the relationship between line and phase quantities of star connected load.
- f) With the help of waveforms and phasor diagram explain AC through series RL circuit.
5. Solve **any two** : **(2×6=12)**
- a) A single phase. 220 V/110 V, 5 KVA transformer has an efficiency of 96% on full load at unity power factor and 95% on half load at unity power factor. Determine for full load condition.
- 1) Iron and copper loss 2) Efficiency at 0.8 of lagging
- b) A capacitor of 79.5 μ F is connected in series with a pure resistance of 30 ohm. The circuit is supplied from 100 V, 50 Hz. Source find
- 1) Impedance
- 2) Current flowing through circuit
- 3) Power factor.
- c) Three equal impedance each of $60\angle 30^\circ$ ohm are connected in delta across three phase, 400 V, 50 Hz. Supply. Calculate :
- 1) line and phase voltage
- 2) line and phase current
- 3) active and reactive power.
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SLR-EP – 8

Seat No.	
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Set	R
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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) **All** questions are **compulsory**.
 - 4) Assume suitable data if **necessary**.
 - 5) Draw **neat** diagrams **whenever** necessary.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**

- 1) The value of leakage co-efficient for electrical machines is usually about
a) 0.5 to 1 b) 4 to 10 c) above 10 d) 1.15 to 1.25
- 2) Two sinusoidal currents are given by the equations ; $i_1 = 10 \sin (\omega t + \pi/3)$ and $i_2 = 15 \sin (\omega t - \pi/4)$. The phase difference between them is _____ degrees.
a) 105 b) 75 c) 15 d) 60
- 3) The r.m.s. value of sinusoidal ac current is equal to its value at an angle of _____ degree.
a) 60 b) 45 c) 20 d) 90
- 4) A transformer having 1000 primary turns is connected to a 250 V ac supply. For a secondary voltage of 400 V, the number of secondary turns should be
a) 1600 b) 400 c) 250 d) 1250
- 5) In a balanced star connected system line voltages lead their respective phase voltages by
a) 120° b) 30° c) 60° d) 45°

P.T.O.



- 6) One of the characteristics of a single phase motor is that it
- a) is self-starting
 - b) is not self-starting
 - c) requires one winding
 - d) none of above
- 7) A step up transformer increases
- a) power
 - b) current
 - c) voltage
 - d) frequency
- 8) In purely resistive circuit the power factor is
- a) zero
 - b) zero leading
 - c) zero lagging
 - d) none of the above
- 9) In star connected balanced load
- a) $I_L = I_{PH}$
 - b) $V_L = V_{PH}$
 - c) $I_L = \sqrt{3} I_{PH}$
 - d) None of the above
- 10) If the admittance of parallel AC circuit is increased, the circuit current
- a) remain constant
 - b) is decreased
 - c) is increased
 - d) none of the above
- 11) What percentage of the maximum power is delivered to a load if load resistance is 10 times greater than the Thevenins resistance of the source to which it is connected ?
- a) 25%
 - b) 50%
 - c) 35%
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- 12) Three 3Ω resistors are connected in the form of equilateral triangle. The total resistance between any two corners is
- a) 2Ω
 - b) 6Ω
 - c) 3Ω
 - d) $4/3\Omega$
- 13) The commercial unit of electrical energy is
- a) K WH
 - b) Joule
 - c) Watt-second
 - d) None of these
- 14) A magnetizing force of 800 AT/m will produce a flux density of _____ in air.
- a) 1 m Wb/m^2
 - b) 1 Wb/m^2
 - c) 10 m Wb/m^2
 - d) 0.5 Wb/m^2



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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
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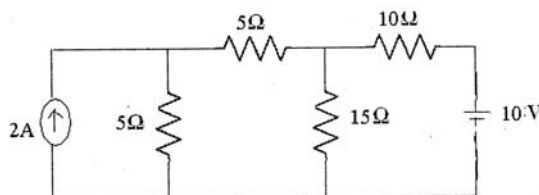
SECTION – I

2. Attempt **any four** of the following : **(4×4=16)**

- a) A d.c. shunt motor after running several hours on constant voltage mains 400 V takes a field current of 1.6 A. If the temperature rise is known to be 40° C, what value of extra circuit resistance is required to adjust the field current to 1.6 A when starting from cold at 20°C? Temperature coefficient = 0.0043/°C at 20° C.
- b) Write short notes on : “B-H Curve and effect on selection of Electromagnetic material”.
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- d) Define and explain following terms :
 - i) Magnetic field strength
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 - iv) Phase
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- f) The self-inductance of a coil having 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10,000 turns, Calculate :
 - 1) Mutual Inductance of the two coil
 - 2) Emf induced in second coil when current in the first coil changes at the rate of 100 A/sec.

3. Solve **any two** : **(2×6=12)**

- a) Write the properties of series and parallel D.C. circuits. Find the current flowing through the resistance of 15 Ω .





- b) A metal ring of mean diameter of 80 cm is made out of two semi-circular pieces of cast iron and cast steel separate at a junction of pieces of copper each of 1 millimeter thickness. If the ring is uniformly wound with 100 turns, calculate the value of the current required to produce a flux density of 0.85 T in the ring. Given that relative permeability of cast iron is 200, and that of cast steel is of 1,200.
- c) Define average value and prove that average value of an alteration quantity over a complete cycle is zero.

SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Derive the expression of average power in purely resistive AC circuit.
- b) Define and explain following terms related to ac circuit :
- 1) Impedance 2) Admittance 3) Active power 4) Power factor
- c) Derive an e.m.f. equation for a single phase transformer.
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- f) With the help of waveforms and phasor diagram explain AC through series RL circuit.
5. Solve **any two** : **(2×6=12)**
- a) A single phase. 220 V/110 V, 5 KVA transformer has an efficiency of 96% on full load at unity power factor and 95% on half load at unity power factor. Determine for full load condition.
- 1) Iron and copper loss 2) Efficiency at 0.8 of lagging
- b) A capacitor of 79.5 μ F is connected in series with a pure resistance of 30 ohm. The circuit is supplied from 100 V, 50 Hz. Source find
- 1) Impedance
- 2) Current flowing through circuit
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- c) Three equal impedance each of $60\angle 30^\circ$ ohm are connected in delta across three phase, 400 V, 50 Hz. Supply. Calculate :
- 1) line and phase voltage
- 2) line and phase current
- 3) active and reactive power.
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SLR-EP – 8

Seat No.	
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Set	S
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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) **All** questions are **compulsory**.
 - 4) Assume suitable data if **necessary**.
 - 5) Draw **neat** diagrams **whenever** necessary.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) One of the characteristics of a single phase motor is that it
 - a) is self-starting
 - b) is not self-starting
 - c) requires one winding
 - d) none of above
- 2) A step up transformer increases
 - a) power
 - b) current
 - c) voltage
 - d) frequency
- 3) In purely resistive circuit the power factor is
 - a) zero
 - b) zero leading
 - c) zero lagging
 - d) none of the above
- 4) In star connected balanced load
 - a) $I_L = I_{PH}$
 - b) $V_L = V_{PH}$
 - c) $I_L = \sqrt{3} I_{PH}$
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- 5) If the admittance of parallel AC circuit is increased, the circuit current
 - a) remain constant
 - b) is decreased
 - c) is increased
 - d) none of the above

P.T.O.



- 6) What percentage of the maximum power is delivered to a load if load resistance is 10 times greater than the Thevenins resistance of the source to which it is connected ?
- a) 25% b) 50% c) 35% d) 33.06%
- 7) Three 3Ω resistors are connected in the form of equilateral triangle. The total resistance between any two corners is
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- 8) The commercial unit of electrical energy is
- a) K WH b) Joule c) Watt-second d) None of these
- 9) A magnetizing force of 800 AT/m will produce a flux density of _____ in air.
- a) 1 m Wb/m^2 b) 1 Wb/m^2 c) 10 m Wb/m^2 d) 0.5 Wb/m^2
- 10) The value of leakage co-efficient for electrical machines is usually about
- a) 0.5 to 1 b) 4 to 10 c) above 10 d) 1.15 to 1.25
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- 12) The r.m.s. value of sinusoidal ac current is equal to its value at an angle of _____ degree.
- a) 60 b) 45 c) 20 d) 90
- 13) A transformer having 1000 primary turns is connected to a 250 V ac supply. For a secondary voltage of 400 V, the number of secondary turns should be
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- 14) In a balanced star connected system line voltages lead their respective phase voltages by
- a) 120° b) 30° c) 60° d) 45°
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Seat No.	
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F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC ELECTRICAL ENGINEERING

Day and Date : Friday, 16-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Assume suitable data if necessary.**
3) **Draw neat diagrams whenever necessary.**

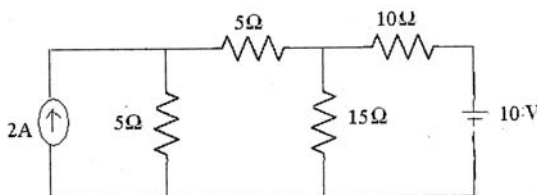
SECTION – I

2. Attempt **any four** of the following : **(4×4=16)**

- a) A d.c. shunt motor after running several hours on constant voltage mains 400 V takes a field current of 1.6 A. If the temperature rise is known to be 40° C, what value of extra circuit resistance is required to adjust the field current to 1.6 A when starting from cold at 20°C? Temperature coefficient = 0.0043/°C at 20° C.
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 - ii) Form Factor
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 - iv) Phase
- e) An electric kettle containing 0.75 liters of water raises the temperature from 30° to boiling point using 0.5 KW power from 240 V d.c. supplies. If overall efficiency is 80%, find the time required (in minutes) to raise the above temperature. Take specific heat of water as 4,200 J/kg k.
- f) The self-inductance of a coil having 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10,000 turns, Calculate :
 - 1) Mutual Inductance of the two coil
 - 2) Emf induced in second coil when current in the first coil changes at the rate of 100 A/sec.

3. Solve **any two** : **(2×6=12)**

- a) Write the properties of series and parallel D.C. circuits. Find the current flowing through the resistance of 15 Ω .





- b) A metal ring of mean diameter of 80 cm is made out of two semi-circular pieces of cast iron and cast steel separate at a junction of pieces of copper each of 1 millimeter thickness. If the ring is uniformly wound with 100 turns, calculate the value of the current required to produce a flux density of 0.85 T in the ring. Given that relative permeability of cast iron is 200, and that of cast steel is of 1,200.
- c) Define average value and prove that average value of an alteration quantity over a complete cycle is zero.

SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Derive the expression of average power in purely resistive AC circuit.
- b) Define and explain following terms related to ac circuit :
- 1) Impedance 2) Admittance 3) Active power 4) Power factor
- c) Derive an e.m.f. equation for a single phase transformer.
- d) State various applications of DC shunt and DC series motor.
- e) Derive the relationship between line and phase quantities of star connected load.
- f) With the help of waveforms and phasor diagram explain AC through series RL circuit.
5. Solve **any two** : **(2×6=12)**
- a) A single phase. 220 V/110 V, 5 KVA transformer has an efficiency of 96% on full load at unity power factor and 95% on half load at unity power factor. Determine for full load condition.
- 1) Iron and copper loss 2) Efficiency at 0.8 of lagging
- b) A capacitor of 79.5 μ F is connected in series with a pure resistance of 30 ohm. The circuit is supplied from 100 V, 50 Hz. Source find
- 1) Impedance
- 2) Current flowing through circuit
- 3) Power factor.
- c) Three equal impedance each of $60\angle 30^\circ$ ohm are connected in delta across three phase, 400 V, 50 Hz. Supply. Calculate :
- 1) line and phase voltage
- 2) line and phase current
- 3) active and reactive power.
-



SLR-EP – 9

Seat No.	
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Set **P**

**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) **Neat** diagrams must be drawn **whenever** necessary.
 - 2) Make **suitable** assumptions, if necessary and mention them **clearly**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 6) Q. No. **2** and Q. No. **4** are Short Answer Type Question.
 - 7) Q. **3** and Q. **5** are Long Answer Type Question.
 - 8) **Use** of log tables and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Change in Heat or Work is
 - A) Exact Differentials
 - B) Inexact Differentials
 - C) Partial Differentials
 - D) None of these
- 2) During a cycle Heat Transfer are given by + 120 KJ, – 60 KJ, 12 KJ, – 48 KJ what is the net work transfer in the cycle ?
 - A) 60000 Nm
 - B) 24000 Nm
 - C) 12000 Nm
 - D) 24 Nm
- 3) Specific Heat is the amount of heat required to raise the temperature
 - A) By unit degree of substance
 - B) By unit degree of unit mass
 - C) By 10 degree of unit mass
 - D) None of the above

P.T.O.



- 4) PMM-1 is impossible according to _____ law.
A) Zeroth law of thermodynamics
B) First law of thermodynamics
C) Second law of thermodynamics
D) Boyles law
- 5) Cadmium or Boron are used as a _____ in Nuclear reactor.
A) Fuel rod
B) Moderator
C) Control rod
D) None of these
- 6) For Medium head and Medium discharge the turbine used is
A) Impulse turbine
B) Francis turbine
C) Kaplan turbine
D) None of these
- 7) Compressed air is used for
A) Pneumatic drills
B) Inflation of automobile tires
C) Spray painting
D) All of these
- 8) The process of removing material from face of work piece is called
A) Chamfering
B) Knurling
C) Turning
D) Facing
- 9) Compression ratio of diesel engine is
A) 3 to 6
B) 16 to 22
C) 5 to 8
D) 23 to 30
- 10) Method of joining of two work pieces of two dissimilar material's above 450° C
A) Welding
B) Brazing
C) Soldering
D) All of these
- 11) Otto cycle is known as
A) Constant Pressure Cycle
B) Constant Volume Cycle
C) Constant Temperature Cycle
D) None of these
- 12) The velocity ratio transmitted between two shafts is given by
A) $N_2/N_1 = d_2/d_1$
B) $N_2/N_1 = d_1/d_2$
C) $N_2/N_1 = d_1+d_2$
D) $N_2/N_1 = d_1 \times d_2$
- 13) Stress is directly proportional to strain is called as
A) Modulus of elasticity
B) Young's Modulus
C) Both (A) and (B)
D) None of these
- 14) _____ gears connect two non-parallel, non-intersecting shafts which are usually at right angles.
A) Spur
B) Bevel
C) Worm and Worm Wheel
D) None of these
-



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions, if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 2 and Q. No. 4 are Short Answer Question.**
 - 5) **Q. 3 and Q. 5 are Long Answer Type Question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any five** of the following : **15**
 - a) What is difference between Heat and Work ? **3**
 - b) State the type of system for following : **3**
 - i) Car Engine ii) Domestic Refrigerator.
 - c) What is an ideal gas ? Derive characteristic equation of gas. **3**
 - d) What is difference between reciprocating and centrifugal pump ? **3**
 - e) Explain first law for a closed system undergoing a cycle. **3**
 - f) What are the function of following units in Thermal power plant ? **3**
 - i) Condenser ii) Economizer iii) Air preheater
 - g) Write a note on thermodynamic state and cycle. **3**

3. Attempt **any three** of the following : **13**
 - a) Fluid enters the nozzle with a velocity of 3300 m/min and the enthalpy of fluid at the exit of nozzle is 2700 KJ/Kg the nozzle is placed horizontal. Neglecting the heat loss in the nozzle determine,
 - i) Velocity of fluid at exit ?
 - ii) The mass flow rate at the inlet of the nozzle if the inlet area is 0.095 m² and specific volume at the inlet is 0.19 m³/kg.
 - iii) The exit area of the nozzle if the specific volume at exit is 0.5 m³/kg. **5**
 - b) Explain with neat sketch working of hydroelectric power plant. **4**
 - c) Explain with neat sketch working of Impulse Turbine. **4**

Set P



- d) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process. **4**
- e) A cycle consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the net work of the cycle. **4**

Process	Q(KW)	W(KW)	ΔU (KW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

SECTION – II

4. Attempt **any five** of the following : **15**
- Explain Otto cycle with P-V and T-S diagram. **3**
 - Discuss in brief Slip and Creep in belt drive. **3**
 - What do you mean by Mechanical Design ? Discuss need of Design. **3**
 - Difference between open belt drive and cross belt drive. **3**
 - Write short note on Brazing Process. **3**
 - Define : **3**
 - Malleability
 - Ductility
 - Hardness
 - Enlist advantages and limitations of Gas welding. **3**
5. Attempt **any three** of the following : **13**
- A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of the engine. Take γ as 1.4. **4**
 - Explain with neat sketch Pillar Drilling Machine. **4**
 - Explain working of two stroke petrol engine with neat sketch. **4**
 - Two parallel shafts, whose center lines are 4.8 m apart, are connected by an open belt drive. The diameter of the large pulley is 1.5 m and that of smaller pulley is 1.05 m. The inlet tension in the belt when stationary is 3 KN. The mass at the belt is 1.5 kg/m length. The coefficient of friction between the belt and pulley is 0.3. Taking centrifugal tension in to account, calculate the power transmitted when the smaller pulley rotates at 400 rpm. **5**



SLR-EP – 9

Seat No.	
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Set

Q

**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) *Neat diagrams must be drawn whenever necessary.*
 - 2) *Make suitable assumptions, if necessary and mention them clearly.*
 - 3) *Figures to the right indicate full marks.*
 - 4) *Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.*
 - 5) *Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.*
 - 6) *Q. No. 2 and Q. No. 4 are Short Answer Type Question.*
 - 7) *Q. 3 and Q. 5 are Long Answer Type Question.*
 - 8) *Use of log tables and non-programmable single memory calculator is allowed.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**

- 1) The process of removing material from face of work piece is called

A) Chamfering	B) Knurling
C) Turning	D) Facing
- 2) Compression ratio of diesel engine is

A) 3 to 6	B) 16 to 22	C) 5 to 8	D) 23 to 30
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- 3) Method of joining of two work pieces of two dissimilar material's above 450° C

A) Welding	B) Brazing
C) Soldering	D) All of these
- 4) Otto cycle is known as

A) Constant Pressure Cycle	B) Constant Volume Cycle
C) Constant Temperature Cycle	D) None of these
- 5) The velocity ratio transmitted between two shafts is given by

A) $N_2/N_1 = d_2/d_1$	B) $N_2/N_1 = d_1/d_2$
C) $N_2/N_1 = d_1+d_2$	D) $N_2/N_1 = d_1 \times d_2$

P.T.O.



- 6) Stress is directly proportional to strain is called as
A) Modulus of elasticity B) Young's Modulus
C) Both (A) and (B) D) None of these
- 7) _____ gears connect two non-parallel, non-intersecting shafts which are usually at right angles.
A) Spur B) Bevel
C) Worm and Worm Wheel D) None of these
- 8) Change in Heat or Work is
A) Exact Differentials
B) Inexact Differentials
C) Partial Differentials
D) None of these
- 9) During a cycle Heat Transfer are given by + 120 KJ, – 60 KJ, 12 KJ, – 48 KJ what is the net work transfer in the cycle ?
A) 60000 Nm B) 24000 Nm
C) 12000 Nm D) 24 Nm
- 10) Specific Heat is the amount of heat required to raise the temperature
A) By unit degree of substance
B) By unit degree of unit mass
C) By 10 degree of unit mass
D) None of the above
- 11) PMM-1 is impossible according to _____ law.
A) Zeroth law of thermodynamics
B) First law of thermodynamics
C) Second law of thermodynamics
D) Boyles law
- 12) Cadmium or Boron are used as a _____ in Nuclear reactor.
A) Fuel rod B) Moderator
C) Control rod D) None of these
- 13) For Medium head and Medium discharge the turbine used is
A) Impulse turbine B) Francis turbine
C) Kaplan turbine D) None of these
- 14) Compressed air is used for
A) Pneumatic drills B) Inflation of automobile tires
C) Spray painting D) All of these
-



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions, if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 2 and Q. No. 4 are Short Answer Question.**
 - 5) **Q. 3 and Q. 5 are Long Answer Type Question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any five** of the following : **15**
 - a) What is difference between Heat and Work ? **3**
 - b) State the type of system for following : **3**
 - i) Car Engine
 - ii) Domestic Refrigerator.
 - c) What is an ideal gas ? Derive characteristic equation of gas. **3**
 - d) What is difference between reciprocating and centrifugal pump ? **3**
 - e) Explain first law for a closed system undergoing a cycle. **3**
 - f) What are the function of following units in Thermal power plant ? **3**
 - i) Condenser
 - ii) Economizer
 - iii) Air preheater
 - g) Write a note on thermodynamic state and cycle. **3**

3. Attempt **any three** of the following : **13**
 - a) Fluid enters the nozzle with a velocity of 3300 m/min and the enthalpy of fluid at the exit of nozzle is 2700 KJ/Kg the nozzle is placed horizontal. Neglecting the heat loss in the nozzle determine,
 - i) Velocity of fluid at exit ?
 - ii) The mass flow rate at the inlet of the nozzle if the inlet area is 0.095 m² and specific volume at the inlet is 0.19 m³/kg.
 - iii) The exit area of the nozzle if the specific volume at exit is 0.5 m³/kg. **5**
 - b) Explain with neat sketch working of hydroelectric power plant. **4**
 - c) Explain with neat sketch working of Impulse Turbine. **4**

Set Q



- d) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process. **4**
- e) A cycle consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the net work of the cycle. **4**

Process	Q(KW)	W(KW)	ΔU (KW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

SECTION – II

4. Attempt **any five** of the following : **15**
- Explain Otto cycle with P-V and T-S diagram. **3**
 - Discuss in brief Slip and Creep in belt drive. **3**
 - What do you mean by Mechanical Design ? Discuss need of Design. **3**
 - Difference between open belt drive and cross belt drive. **3**
 - Write short note on Brazing Process. **3**
 - Define : **3**
 - Malleability
 - Ductility
 - Hardness
 - Enlist advantages and limitations of Gas welding. **3**
5. Attempt **any three** of the following : **13**
- A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of the engine. Take γ as 1.4. **4**
 - Explain with neat sketch Pillar Drilling Machine. **4**
 - Explain working of two stroke petrol engine with neat sketch. **4**
 - Two parallel shafts, whose center lines are 4.8 m apart, are connected by an open belt drive. The diameter of the large pulley is 1.5 m and that of smaller pulley is 1.05 m. The inlet tension in the belt when stationary is 3 KN. The mass at the belt is 1.5 kg/m length. The coefficient of friction between the belt and pulley is 0.3. Taking centrifugal tension in to account, calculate the power transmitted when the smaller pulley rotates at 400 rpm. **5**



SLR-EP – 9

Seat
No.

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R

F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions:**
- 1) **Neat** diagrams must be drawn **whenever** necessary.
 - 2) Make **suitable** assumptions, if necessary and mention them **clearly**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only.** **Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 6) Q. No. **2** and Q. No. **4** are Short Answer Type Question.
 - 7) Q. **3** and Q. **5** are Long Answer Type Question.
 - 8) **Use** of log tables and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Cadmium or Boron are used as a _____ in Nuclear reactor.
A) Fuel rod B) Moderator
C) Control rod D) None of these
- 2) For Medium head and Medium discharge the turbine used is
A) Impulse turbine B) Francis turbine
C) Kaplan turbine D) None of these
- 3) Compressed air is used for
A) Pneumatic drills B) Inflation of automobile tires
C) Spray painting D) All of these
- 4) The process of removing material from face of work piece is called
A) Chamfering B) Knurling
C) Turning D) Facing
- 5) Compression ratio of diesel engine is
A) 3 to 6 B) 16 to 22 C) 5 to 8 D) 23 to 30

P.T.O.



- 6) Method of joining of two work pieces of two dissimilar material's above 450°C
- A) Welding
B) Brazing
C) Soldering
D) All of these
- 7) Otto cycle is known as
- A) Constant Pressure Cycle
B) Constant Volume Cycle
C) Constant Temperature Cycle
D) None of these
- 8) The velocity ratio transmitted between two shafts is given by
- A) $N_2/N_1 = d_2/d_1$
B) $N_2/N_1 = d_1/d_2$
C) $N_2/N_1 = d_1+d_2$
D) $N_2/N_1 = d_1 \times d_2$
- 9) Stress is directly proportional to strain is called as
- A) Modulus of elasticity
B) Young's Modulus
C) Both (A) and (B)
D) None of these
- 10) _____ gears connect two non-parallel, non-intersecting shafts which are usually at right angles.
- A) Spur
B) Bevel
C) Worm and Worm Wheel
D) None of these
- 11) Change in Heat or Work is
- A) Exact Differentials
B) Inexact Differentials
C) Partial Differentials
D) None of these
- 12) During a cycle Heat Transfer are given by + 120 KJ, – 60 KJ, 12 KJ, – 48 KJ what is the net work transfer in the cycle ?
- A) 60000 Nm
B) 24000 Nm
C) 12000 Nm
D) 24 Nm
- 13) Specific Heat is the amount of heat required to raise the temperature
- A) By unit degree of substance
B) By unit degree of unit mass
C) By 10 degree of unit mass
D) None of the above
- 14) PMM-1 is impossible according to _____ law.
- A) Zeroth law of thermodynamics
B) First law of thermodynamics
C) Second law of thermodynamics
D) Boyles law
-



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions, if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 2 and Q. No. 4 are Short Answer Question.**
 - 5) **Q. 3 and Q. 5 are Long Answer Type Question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any five** of the following : **15**
 - a) What is difference between Heat and Work ? **3**
 - b) State the type of system for following : **3**
 - i) Car Engine
 - ii) Domestic Refrigerator.
 - c) What is an ideal gas ? Derive characteristic equation of gas. **3**
 - d) What is difference between reciprocating and centrifugal pump ? **3**
 - e) Explain first law for a closed system undergoing a cycle. **3**
 - f) What are the function of following units in Thermal power plant ? **3**
 - i) Condenser
 - ii) Economizer
 - iii) Air preheater
 - g) Write a note on thermodynamic state and cycle. **3**

3. Attempt **any three** of the following : **13**
 - a) Fluid enters the nozzle with a velocity of 3300 m/min and the enthalpy of fluid at the exit of nozzle is 2700 KJ/Kg the nozzle is placed horizontal. Neglecting the heat loss in the nozzle determine,
 - i) Velocity of fluid at exit ?
 - ii) The mass flow rate at the inlet of the nozzle if the inlet area is 0.095 m² and specific volume at the inlet is 0.19 m³/kg.
 - iii) The exit area of the nozzle if the specific volume at exit is 0.5 m³/kg. **5**
 - b) Explain with neat sketch working of hydroelectric power plant. **4**
 - c) Explain with neat sketch working of Impulse Turbine. **4**

Set R



- d) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process. **4**
- e) A cycle consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the net work of the cycle. **4**

Process	Q(KW)	W(KW)	ΔU (KW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

SECTION – II

4. Attempt **any five** of the following : **15**
- Explain Otto cycle with P-V and T-S diagram. **3**
 - Discuss in brief Slip and Creep in belt drive. **3**
 - What do you mean by Mechanical Design ? Discuss need of Design. **3**
 - Difference between open belt drive and cross belt drive. **3**
 - Write short note on Brazing Process. **3**
 - Define : **3**
 - Malleability
 - Ductility
 - Hardness
 - Enlist advantages and limitations of Gas welding. **3**
5. Attempt **any three** of the following : **13**
- A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of the engine. Take γ as 1.4. **4**
 - Explain with neat sketch Pillar Drilling Machine. **4**
 - Explain working of two stroke petrol engine with neat sketch. **4**
 - Two parallel shafts, whose center lines are 4.8 m apart, are connected by an open belt drive. The diameter of the large pulley is 1.5 m and that of smaller pulley is 1.05 m. The inlet tension in the belt when stationary is 3 KN. The mass at the belt is 1.5 kg/m length. The coefficient of friction between the belt and pulley is 0.3. Taking centrifugal tension in to account, calculate the power transmitted when the smaller pulley rotates at 400 rpm. **5**



SLR-EP – 9

Seat No.	
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Set

S

**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions:**
- 1) **Neat** diagrams must be drawn **whenever** necessary.
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 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
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 - 6) Q. No. **2** and Q. No. **4** are Short Answer Type Question.
 - 7) Q. **3** and Q. **5** are Long Answer Type Question.
 - 8) **Use** of log tables and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) Method of joining of two work pieces of two dissimilar material's above 450° C
A) Welding
B) Brazing
C) Soldering
D) All of these
 - 2) Otto cycle is known as
A) Constant Pressure Cycle
B) Constant Volume Cycle
C) Constant Temperature Cycle
D) None of these
 - 3) The velocity ratio transmitted between two shafts is given by
A) $N_2/N_1 = d_2/d_1$
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A) Modulus of elasticity
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P.T.O.



- 5) _____ gears connect two non-parallel, non-intersecting shafts which are usually at right angles.
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- 7) During a cycle Heat Transfer are given by + 120 KJ, – 60 KJ, 12 KJ, – 48 KJ what is the net work transfer in the cycle ?
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- A) Zeroth law of thermodynamics
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- A) Impulse turbine
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- 12) Compressed air is used for
- A) Pneumatic drills
B) Inflation of automobile tires
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- 13) The process of removing material from face of work piece is called
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- A) 3 to 6
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-



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2016
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 19-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
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SECTION – I

2. Attempt **any five** of the following : **15**
 - a) What is difference between Heat and Work ? **3**
 - b) State the type of system for following : **3**
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 - c) What is an ideal gas ? Derive characteristic equation of gas. **3**
 - d) What is difference between reciprocating and centrifugal pump ? **3**
 - e) Explain first law for a closed system undergoing a cycle. **3**
 - f) What are the function of following units in Thermal power plant ? **3**
 - i) Condenser ii) Economizer iii) Air preheater
 - g) Write a note on thermodynamic state and cycle. **3**

3. Attempt **any three** of the following : **13**
 - a) Fluid enters the nozzle with a velocity of 3300 m/min and the enthalpy of fluid at the exit of nozzle is 2700 KJ/Kg the nozzle is placed horizontal. Neglecting the heat loss in the nozzle determine,
 - i) Velocity of fluid at exit ?
 - ii) The mass flow rate at the inlet of the nozzle if the inlet area is 0.095 m² and specific volume at the inlet is 0.19 m³/kg.
 - iii) The exit area of the nozzle if the specific volume at exit is 0.5 m³/kg. **5**
 - b) Explain with neat sketch working of hydroelectric power plant. **4**
 - c) Explain with neat sketch working of Impulse Turbine. **4**

Set S



- d) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process. **4**
- e) A cycle consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the net work of the cycle. **4**

Process	Q(KW)	W(KW)	ΔU (KW)
1 – 2	40	–	25
2 – 3	20	–10	–
3 – 4	–20	–	–
4 – 1	0	8	–

SECTION – II

4. Attempt **any five** of the following : **15**
- Explain Otto cycle with P-V and T-S diagram. **3**
 - Discuss in brief Slip and Creep in belt drive. **3**
 - What do you mean by Mechanical Design ? Discuss need of Design. **3**
 - Difference between open belt drive and cross belt drive. **3**
 - Write short note on Brazing Process. **3**
 - Define : **3**
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 - Ductility
 - Hardness
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5. Attempt **any three** of the following : **13**
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 - Explain with neat sketch Pillar Drilling Machine. **4**
 - Explain working of two stroke petrol engine with neat sketch. **4**
 - Two parallel shafts, whose center lines are 4.8 m apart, are connected by an open belt drive. The diameter of the large pulley is 1.5 m and that of smaller pulley is 1.05 m. The inlet tension in the belt when stationary is 3 KN. The mass at the belt is 1.5 kg/m length. The coefficient of friction between the belt and pulley is 0.3. Taking centrifugal tension in to account, calculate the power transmitted when the smaller pulley rotates at 400 rpm. **5**



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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Attempt **any three** questions from **each** Section.
4) Figures to the **right** indicate **full** marks.
5) **Use of calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) If e^{ny^2} is an integrating factor of the differential equation $\frac{dx}{dy} + xy = e^{y^2/2}$, then the value of n is
- a) -1 b) 1 c) $\frac{1}{2}$ d) $-\frac{1}{2}$
- 2) If the differential equation $(ax^2y + 2y^2 - 7)dx + (x^3 + bxy - 8)dy = 0$ is exact, then the value of a and b are
- a) a = 3, b = 4 b) a = 3, b = 1 c) a = 4, b = 3 d) a = 1, b = 3
- 3) The length of subnormal to the curve $y^2 = 4ax$ is
- a) a b) 2a c) 3a d) 4a
- 4) The orthogonal trajectories of family of curve $xy = a$ is
- a) $x^2 + y^2 = c$ b) $y^2 = 4ax$ c) $x = c \cdot y$ d) $y^2 - x^2 = c$
- 5) Which of the following method is not a step by step method ?
- a) Euler's method b) Runge Kutta method of fourth order
c) Taylor's series method d) Euler's modified method
- 6) If $\frac{dy}{dx} = x + y$ with $y(0) = 1$ and $h = 0.2$, then by Euler's method the approximate value of $y(0.2)$ is equals to
- a) 1 b) 1.2 c) 1.4 d) -1.2

P.T.O.



- 7) To find the value of the derivatives numerically at the beginning or near to the beginning value of argument x , we use
- a) Newton's forward difference formula b) Newton's backward difference formula
 c) Central difference formula d) Divided difference formula
- 8) The curve $x^2 - y^2 = a^2$ is symmetrical
- a) about both axes b) about only one axis
 c) in opposite quadrants d) none of these
- 9) The length of the arc of the curve $x = f(t)$, $y = \phi(t)$ is
- a) $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$ b) $\int_{t_1}^{t_2} \sqrt{\frac{dx}{dt} + \frac{dy}{dt}} dt$
 c) $\int_{t_1}^{t_2} \left(\frac{dx}{dt} + \frac{dy}{dt}\right) dt$ d) $\int_{t_1}^{t_2} \left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right] dt$
- 10) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}}$ is equal to
- a) $\sqrt{2\pi}$ b) $\sqrt{\frac{\pi}{2}}$ c) $\sqrt{\pi}$ d) $\sqrt{2} \pi$
- 11) Which of the following is true ?
- a) $\beta(n,m) = \beta(m,n)$ b) $\beta(m,n) = \frac{\sqrt{m}}{\sqrt{m+n}}$
 c) $\beta(m,n) = \frac{\sqrt{n}}{\sqrt{m+n}}$ d) $\beta(m,m) = 0$
- 12) By changing the order $\int_0^a \int_0^x f(x,y) dy dx$ is equal to
- a) $\int_0^a \int_0^y f(x,y) dx dy$ b) $\int_0^x \int_0^a f(x,y) dx dy$ c) $\int_0^a \int_0^a f(x,y) dx dy$ d) None of these
- 13) $\int_0^{\pi/2} \int_0^{\pi/2} \int_0^1 dr d\theta d\phi =$
- a) π^2 b) $\pi^2/4$ c) $\pi^2/2$ d) π
- 14) If the density at any point varies as the distance of the point from the x -axis, then ρ is equal to
- a) kxy b) kx c) ky d) None of these



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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.
3) **Use** of calculator is **allowed**.

SECTION – I

2. a) Solve : $(x + y)dx + (3x + 3y - 4) dy = 0$. 3
b) Solve $(y \cdot \sec^2 x + \sec x \cdot \tan x)dx + (\tan x + 2y)dy = 0$. 3
c) Solve : $\frac{dy}{dx} + y \cdot \tan x = x^2 \cos^2(x)$. 4
- OR
- c) Solve : $x \cos y \frac{dy}{dx} + \sin y = x \sin^2 y$. 4
3. Attempt the following :
- a) Find the orthogonal trajectories of the curve $y = x + ae^x$ where 'a' is a parameter. 3
b) Find the equation of the curve through the point (1, 0) such that the length of the subnormal at any point is directly proportional to $\frac{1}{x^3}$. 3
c) The charge 'q' on the plate of a condenser of capacity C, charged through a resistance R by a steady voltage V satisfies the differential equation $R \frac{dq}{dt} + \frac{q}{c} = V$ if $q = 0$ when $t = 0$, then show that charge 'q' is given by $q = cv \left(1 - e^{-\frac{t}{RC}} \right)$. 3
4. Attempt the following :
- a) Using Picard's method, find the solution of $\frac{dy}{dx} = 1 + xy$ when $y(0) = 1$ upto third approximation. 3

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b) Using Runge Kutta method of fourth order to find y at $x = 1.1$ in one step, if $\frac{dy}{dx} = x^2 + y^2$ with initial condition $y(1) = 1.5$. 3

c) Using Euler's method, find the approximate value of y at $x = 0.8$, where $\frac{dy}{dx} = 1 - 2xy$ with $y(0) = 0$, taking $h = 0.2$. 3

5. a) Find $\frac{dy}{dx}, \frac{d^2y}{dx^2}$ at $x = 2$ and at $x = 2.7$ from the following data. 5

x	:	2	2.2	2.4	2.6	2.8
y	:	2	5.576	9.968	15.272	21.584

b) Using divided difference formula, find the value of $\frac{dy}{dx}$ at $x = 9$ from the following data. 4

x	:	5	7	11	13	17
y	:	150	392	1452	2366	5202

SECTION – II

6. a) Evaluate $\int_0^1 \sqrt{x \log \left(\frac{1}{x} \right)} dx$. 3

b) Evaluate $\int_0^1 \sqrt{x} (1 - x^2)^{1/3} dx$. 3

c) Prove that $\int_0^a \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log \left(\frac{a}{b} \right)$ where a is parameter. 3

7. a) Trace the curve $y^2(2a - x) = x^3$. 4

b) Trace the curve $r = 3 \sin 2\theta$. 3

c) Show that the length of the parabola $y^2 = 4ax$ from the vertex to the end of the latus rectum is a $\left[\sqrt{2} + \log(1 + \sqrt{2}) \right]$. 3



8. a) Evaluate $\int_0^1 \int_0^x e^{x+y} dy dx$. **3**

b) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dx dy dz$. **3**

c) Change the order of integration and evaluate $\int_1^2 \int_1^{x^2} \left(\frac{x^2}{y} \right) dx dy$. **3**

OR

c) Evaluate $\iint (x^2 + y^2) x dx dy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$. **3**

9. a) Find the area common to the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ by double integration. **3**

b) The density of a uniform circular lamina of radius 'a' varies as the square of its density from a fixed point on the circumference of the circle $r = 2a \cos \theta$. Find the mass of Lamina. **3**

c) Calculate by double integration the volume generated by the revolution of the cardioid $r = a(1 - \cos \theta)$ about its axis of symmetry. **3**



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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Attempt **any three** questions from **each** Section.
4) Figures to the **right** indicate **full** marks.
5) **Use of calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

1) The curve $x^2 - y^2 = a^2$ is symmetrical

- | | |
|--------------------------|------------------------|
| a) about both axes | b) about only one axis |
| c) in opposite quadrants | d) none of these |

2) The length of the arc of the curve $x = f(t)$, $y = \phi(t)$ is

- | | |
|---|---|
| a) $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$ | b) $\int_{t_1}^{t_2} \sqrt{\frac{dx}{dt} + \frac{dy}{dt}} dt$ |
| c) $\int_{t_1}^{t_2} \left(\frac{dx}{dt} + \frac{dy}{dt}\right) dt$ | d) $\int_{t_1}^{t_2} \left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right] dt$ |

3) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}}$ is equal to

- | | | | |
|------------------|---------------------------|-----------------|-------------------|
| a) $\sqrt{2\pi}$ | b) $\sqrt{\frac{\pi}{2}}$ | c) $\sqrt{\pi}$ | d) $\sqrt{2} \pi$ |
|------------------|---------------------------|-----------------|-------------------|

4) Which of the following is true ?

- | | |
|--|--|
| a) $\beta(n,m) = \beta(m,n)$ | b) $\beta(m,n) = \frac{\sqrt{m}}{m+n}$ |
| c) $\beta(m,n) = \frac{\sqrt{n}}{m+n}$ | d) $\beta(m,m) = 0$ |



- 5) By changing the order $\int_0^a \int_0^x f(x, y) dy dx$ is equal to
- a) $\int_0^a \int_0^y f(x, y) dx dy$ b) $\int_0^x \int_0^a f(x, y) dx dy$ c) $\int_0^a \int_y^a f(x, y) dx dy$ d) None of these
- 6) $\int_0^{\pi/2} \int_0^{\pi/2} \int_0^1 dr d\theta d\phi =$
- a) π^2 b) $\pi^2/4$ c) $\pi^2/2$ d) π
- 7) If the density at any point varies as the distance of the point from the x-axis, then ρ is equal to
- a) kxy b) kx c) ky d) None of these
- 8) If e^{ny^2} is an integrating factor of the differential equation $\frac{dx}{dy} + xy = e^{y^2/2}$, then the value of n is
- a) -1 b) 1 c) $1/2$ d) $-1/2$
- 9) If the differential equation $(ax^2y + 2y^2 - 7)dx + (x^3 + bxy - 8)dy = 0$ is exact, then the value of a and b are
- a) $a = 3, b = 4$ b) $a = 3, b = 1$ c) $a = 4, b = 3$ d) $a = 1, b = 3$
- 10) The length of subnormal to the curve $y^2 = 4ax$ is
- a) a b) $2a$ c) $3a$ d) $4a$
- 11) The orthogonal trajectories of family of curve $xy = a$ is
- a) $x^2 + y^2 = c$ b) $y^2 = 4ax$ c) $x = c \cdot y$ d) $y^2 - x^2 = c$
- 12) Which of the following method is not a step by step method ?
- a) Euler's method b) Runge Kutta method of fourth order
c) Taylor's series method d) Euler's modified method
- 13) If $\frac{dy}{dx} = x + y$ with $y(0) = 1$ and $h = 0.2$, then by Euler's method the approximate value of $y(0.2)$ is equals to
- a) 1 b) 1.2 c) 1.4 d) -1.2
- 14) To find the value of the derivatives numerically at the beginning or near to the beginning value of argument x, we use
- a) Newton's forward difference formula b) Newton's backward difference formula
c) Central difference formula d) Divided difference formula



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**F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.
3) **Use** of calculator is **allowed**.

SECTION – I

2. a) Solve : $(x + y)dx + (3x + 3y - 4) dy = 0$. **3**
- b) Solve $(y \cdot \sec^2 x + \sec x \cdot \tan x)dx + (\tan x + 2y)dy = 0$. **3**
- c) Solve : $\frac{dy}{dx} + y \cdot \tan x = x^2 \cos^2(x)$. **4**
- OR
- c) Solve : $x \cos y \frac{dy}{dx} + \sin y = x \sin^2 y$. **4**
3. Attempt the following :
- a) Find the orthogonal trajectories of the curve $y = x + ae^x$ where 'a' is a parameter. **3**
- b) Find the equation of the curve through the point (1, 0) such that the length of the subnormal at any point is directly proportional to $\frac{1}{x^3}$. **3**
- c) The charge 'q' on the plate of a condenser of capacity C, charged through a resistance R by a steady voltage V satisfies the differential equation $R \frac{dq}{dt} + \frac{q}{c} = V$ if $q = 0$ when $t = 0$, then show that charge 'q' is given by $q = cv \left(1 - e^{-\frac{t}{RC}} \right)$. **3**
4. Attempt the following :
- a) Using Picard's method, find the solution of $\frac{dy}{dx} = 1 + xy$ when $y(0) = 1$ upto third approximation. **3**

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- b) Using Runge Kutta method of fourth order to find y at $x = 1.1$ in one step, if $\frac{dy}{dx} = x^2 + y^2$ with initial condition $y(1) = 1.5$. 3
- c) Using Euler's method, find the approximate value of y at $x = 0.8$, where $\frac{dy}{dx} = 1 - 2xy$ with $y(0) = 0$, taking $h = 0.2$. 3
5. a) Find $\frac{dy}{dx}, \frac{d^2y}{dx^2}$ at $x = 2$ and at $x = 2.7$ from the following data. 5
- | | | | | | | |
|----------|---|---|-------|-------|--------|--------|
| x | : | 2 | 2.2 | 2.4 | 2.6 | 2.8 |
| y | : | 2 | 5.576 | 9.968 | 15.272 | 21.584 |
- b) Using divided difference formula, find the value of $\frac{dy}{dx}$ at $x = 9$ from the following data. 4
- | | | | | | | |
|----------|---|-----|-----|------|------|------|
| x | : | 5 | 7 | 11 | 13 | 17 |
| y | : | 150 | 392 | 1452 | 2366 | 5202 |

SECTION – II

6. a) Evaluate $\int_0^1 \sqrt{x \log \left(\frac{1}{x} \right)} dx$. 3
- b) Evaluate $\int_0^1 \sqrt{x} (1 - x^2)^{1/3} dx$. 3
- c) Prove that $\int_0^a \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log \left(\frac{a}{b} \right)$ where a is parameter. 3
7. a) Trace the curve $y^2(2a - x) = x^3$. 4
- b) Trace the curve $r = 3 \sin 2\theta$. 3
- c) Show that the length of the parabola $y^2 = 4ax$ from the vertex to the end of the latus rectum is a $\left[\sqrt{2} + \log(1 + \sqrt{2}) \right]$. 3



8. a) Evaluate $\int_0^1 \int_0^x e^{x+y} dy dx$. **3**

b) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dx dy dz$. **3**

c) Change the order of integration and evaluate $\int_1^2 \int_1^{x^2} \left(\frac{x^2}{y} \right) dx dy$. **3**

OR

c) Evaluate $\iint (x^2 + y^2) x dx dy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$. **3**

9. a) Find the area common to the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ by double integration. **3**

b) The density of a uniform circular lamina of radius 'a' varies as the square of its density from a fixed point on the circumference of the circle $r = 2a \cos \theta$. Find the mass of Lamina. **3**

c) Calculate by double integration the volume generated by the revolution of the cardioid $r = a(1 - \cos \theta)$ about its axis of symmetry. **3**



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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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3) Attempt **any three** questions from **each** Section.
4) Figures to the **right** indicate **full** marks.
5) **Use of calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- Which of the following method is not a step by step method ?
 - Euler's method
 - Runge Kutta method of fourth order
 - Taylor's series method
 - Euler's modified method
- If $\frac{dy}{dx} = x + y$ with $y(0) = 1$ and $h = 0.2$, then by Euler's method the approximate value of $y(0.2)$ is equals to
 - 1
 - 1.2
 - 1.4
 - 1.2
- To find the value of the derivatives numerically at the beginning or near to the beginning value of argument x , we use
 - Newton's forward difference formula
 - Newton's backward difference formula
 - Central difference formula
 - Divided difference formula
- The curve $x^2 - y^2 = a^2$ is symmetrical
 - about both axes
 - about only one axis
 - in opposite quadrants
 - none of these
- The length of the arc of the curve $x = f(t)$, $y = \phi(t)$ is

a) $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$

b) $\int_{t_1}^{t_2} \sqrt{\frac{dx}{dt} + \frac{dy}{dt}} dt$

c) $\int_{t_1}^{t_2} \left(\frac{dx}{dt} + \frac{dy}{dt}\right) dt$

d) $\int_{t_1}^{t_2} \left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right] dt$

P.T.O.



- 6) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}}$ is equal to
- a) $\sqrt{2\pi}$ b) $\sqrt{\frac{\pi}{2}}$ c) $\sqrt{\pi}$ d) $\sqrt{2} \pi$
- 7) Which of the following is true ?
- a) $\beta(n,m) = \beta(m,n)$ b) $\beta(m,n) = \frac{\sqrt{m}}{\sqrt{m+n}}$
- c) $\beta(m,n) = \frac{\sqrt{n}}{\sqrt{m+n}}$ d) $\beta(m,m) = 0$
- 8) By changing the order $\int_0^a \int_0^x f(x,y) dy dx$ is equal to
- a) $\int_0^a \int_0^y f(x,y) dx dy$ b) $\int_0^x \int_0^a f(x,y) dx dy$ c) $\int_0^a \int_0^a f(x,y) dx dy$ d) None of these
- 9) $\int_0^{\pi/2} \int_0^{\pi/2} \int_0^1 dr d\theta d\phi =$
- a) π^2 b) $\pi^2/4$ c) $\pi^2/2$ d) π
- 10) If the density at any point varies as the distance of the point from the x-axis, then ρ is equal to
- a) kxy b) kx c) ky d) None of these
- 11) If e^{ny^2} is an integrating factor of the differential equation $\frac{dx}{dy} + xy = e^{y^2/2}$, then the value of n is
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- 12) If the differential equation $(ax^2y + 2y^2 - 7)dx + (x^3 + bxy - 8)dy = 0$ is exact, then the value of a and b are
- a) $a = 3, b = 4$ b) $a = 3, b = 1$ c) $a = 4, b = 3$ d) $a = 1, b = 3$
- 13) The length of subnormal to the curve $y^2 = 4ax$ is
- a) a b) $2a$ c) $3a$ d) $4a$
- 14) The orthogonal trajectories of family of curve $xy = a$ is
- a) $x^2 + y^2 = c$ b) $y^2 = 4ax$ c) $x = c \cdot y$ d) $y^2 - x^2 = c$



Seat No.	
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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
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3) **Use** of calculator is **allowed**.

SECTION – I

2. a) Solve : $(x + y)dx + (3x + 3y - 4) dy = 0$. 3
b) Solve $(y \cdot \sec^2 x + \sec x \cdot \tan x)dx + (\tan x + 2y)dy = 0$. 3
c) Solve : $\frac{dy}{dx} + y \cdot \tan x = x^2 \cos^2(x)$. 4
- OR
- c) Solve : $x \cos y \frac{dy}{dx} + \sin y = x \sin^2 y$. 4
3. Attempt the following :
- a) Find the orthogonal trajectories of the curve $y = x + ae^x$ where 'a' is a parameter. 3
b) Find the equation of the curve through the point (1, 0) such that the length of the subnormal at any point is directly proportional to $\frac{1}{x^3}$. 3
c) The charge 'q' on the plate of a condenser of capacity C, charged through a resistance R by a steady voltage V satisfies the differential equation $R \frac{dq}{dt} + \frac{q}{c} = V$ if $q = 0$ when $t = 0$, then show that charge 'q' is given by $q = cv \left(1 - e^{-\frac{t}{RC}} \right)$. 3
4. Attempt the following :
- a) Using Picard's method, find the solution of $\frac{dy}{dx} = 1 + xy$ when $y(0) = 1$ upto third approximation. 3

Set R



b) Using Runge Kutta method of fourth order to find y at $x = 1.1$ in one step, if $\frac{dy}{dx} = x^2 + y^2$ with initial condition $y(1) = 1.5$. 3

c) Using Euler's method, find the approximate value of y at $x = 0.8$, where $\frac{dy}{dx} = 1 - 2xy$ with $y(0) = 0$, taking $h = 0.2$. 3

5. a) Find $\frac{dy}{dx}, \frac{d^2y}{dx^2}$ at $x = 2$ and at $x = 2.7$ from the following data. 5

x	:	2	2.2	2.4	2.6	2.8
y	:	2	5.576	9.968	15.272	21.584

b) Using divided difference formula, find the value of $\frac{dy}{dx}$ at $x = 9$ from the following data. 4

x	:	5	7	11	13	17
y	:	150	392	1452	2366	5202

SECTION – II

6. a) Evaluate $\int_0^1 \sqrt{x \log\left(\frac{1}{x}\right)} dx$. 3

b) Evaluate $\int_0^1 \sqrt{x} (1 - x^2)^{1/3} dx$. 3

c) Prove that $\int_0^a \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log\left(\frac{a}{b}\right)$ where a is parameter. 3

7. a) Trace the curve $y^2(2a - x) = x^3$. 4

b) Trace the curve $r = 3 \sin 2\theta$. 3

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8. a) Evaluate $\int_0^1 \int_0^x e^{x+y} dy dx$. **3**

b) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dx dy dz$. **3**

c) Change the order of integration and evaluate $\int_1^2 \int_1^{x^2} \left(\frac{x^2}{y} \right) dx dy$. **3**

OR

c) Evaluate $\iint (x^2 + y^2) x dx dy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$. **3**

9. a) Find the area common to the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ by double integration. **3**

b) The density of a uniform circular lamina of radius 'a' varies as the square of its density from a fixed point on the circumference of the circle $r = 2a \cos \theta$. Find the mass of Lamina. **3**

c) Calculate by double integration the volume generated by the revolution of the cardioid $r = a(1 - \cos \theta)$ about its axis of symmetry. **3**



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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Attempt **any three** questions from **each** Section.
4) Figures to the **right** indicate **full** marks.
5) **Use of calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

1) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}}$ is equal to

a) $\sqrt{2\pi}$

b) $\sqrt{\frac{\pi}{2}}$

c) $\sqrt{\pi}$

d) $\sqrt{2} \pi$

2) Which of the following is true ?

a) $\beta(n, m) = \beta(m, n)$

b) $\beta(m, n) = \frac{\sqrt{m}}{m+n}$

c) $\beta(m, n) = \frac{\sqrt{n}}{m+n}$

d) $\beta(m, m) = 0$

3) By changing the order $\int_0^a \int_0^x f(x, y) dy dx$ is equal to

a) $\int_0^a \int_0^y f(x, y) dx dy$

b) $\int_0^x \int_0^a f(x, y) dx dy$

c) $\int_0^a \int_0^a f(x, y) dx dy$

d) None of these

4) $\int_0^{\pi/2} \int_0^{\pi/2} \int_0^1 dr d\theta d\phi =$

a) π^2

b) $\frac{\pi^2}{4}$

c) $\frac{\pi^2}{2}$

d) π

P.T.O.



- 5) If the density at any point varies as the distance of the point from the x-axis, then ρ is equal to
- a) kxy b) kx c) ky d) None of these
- 6) If e^{ny^2} is an integrating factor of the differential equation $\frac{dx}{dy} + xy = e^{y^2/2}$, then the value of n is
- a) -1 b) 1 c) $\frac{1}{2}$ d) $-\frac{1}{2}$
- 7) If the differential equation $(ax^2y + 2y^2 - 7)dx + (x^3 + bxy - 8)dy = 0$ is exact, then the value of a and b are
- a) $a = 3, b = 4$ b) $a = 3, b = 1$ c) $a = 4, b = 3$ d) $a = 1, b = 3$
- 8) The length of subnormal to the curve $y^2 = 4ax$ is
- a) a b) $2a$ c) $3a$ d) $4a$
- 9) The orthogonal trajectories of family of curve $xy = a$ is
- a) $x^2 + y^2 = c$ b) $y^2 = 4ax$ c) $x = c \cdot y$ d) $y^2 - x^2 = c$
- 10) Which of the following method is not a step by step method ?
- a) Euler's method b) Runge Kutta method of fourth order
c) Taylor's series method d) Euler's modified method
- 11) If $\frac{dy}{dx} = x + y$ with $y(0) = 1$ and $h = 0.2$, then by Euler's method the approximate value of $y(0.2)$ is equals to
- a) 1 b) 1.2 c) 1.4 d) -1.2
- 12) To find the value of the derivatives numerically at the beginning or near to the beginning value of argument x , we use
- a) Newton's forward difference formula b) Newton's backward difference formula
c) Central difference formula d) Divided difference formula
- 13) The curve $x^2 - y^2 = a^2$ is symmetrical
- a) about both axes b) about only one axis
c) in opposite quadrants d) none of these
- 14) The length of the arc of the curve $x = f(t), y = \phi(t)$ is
- a) $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$ b) $\int_{t_1}^{t_2} \sqrt{\frac{dx}{dt} + \frac{dy}{dt}} dt$
c) $\int_{t_1}^{t_2} \left(\frac{dx}{dt} + \frac{dy}{dt}\right) dt$ d) $\int_{t_1}^{t_2} \left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right] dt$



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F.E. (Part – II) (New CGPA) Examination, 2016
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 21-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.
3) **Use** of calculator is **allowed**.

SECTION – I

2. a) Solve : $(x + y)dx + (3x + 3y - 4) dy = 0$. 3
b) Solve $(y \cdot \sec^2 x + \sec x \cdot \tan x)dx + (\tan x + 2y)dy = 0$. 3
c) Solve : $\frac{dy}{dx} + y \cdot \tan x = x^2 \cos^2(x)$. 4
- OR
- c) Solve : $x \cos y \frac{dy}{dx} + \sin y = x \sin^2 y$. 4
3. Attempt the following :
- a) Find the orthogonal trajectories of the curve $y = x + ae^x$ where 'a' is a parameter. 3
b) Find the equation of the curve through the point (1, 0) such that the length of the subnormal at any point is directly proportional to $\frac{1}{x^3}$. 3
c) The charge 'q' on the plate of a condenser of capacity C, charged through a resistance R by a steady voltage V satisfies the differential equation $R \frac{dq}{dt} + \frac{q}{c} = V$ if $q = 0$ when $t = 0$, then show that charge 'q' is given by $q = cv \left(1 - e^{-\frac{t}{RC}} \right)$. 3
4. Attempt the following :
- a) Using Picard's method, find the solution of $\frac{dy}{dx} = 1 + xy$ when $y(0) = 1$ upto third approximation. 3

Set S



b) Using Runge Kutta method of fourth order to find y at $x = 1.1$ in one step, if $\frac{dy}{dx} = x^2 + y^2$ with initial condition $y(1) = 1.5$. 3

c) Using Euler's method, find the approximate value of y at $x = 0.8$, where $\frac{dy}{dx} = 1 - 2xy$ with $y(0) = 0$, taking $h = 0.2$. 3

5. a) Find $\frac{dy}{dx}, \frac{d^2y}{dx^2}$ at $x = 2$ and at $x = 2.7$ from the following data. 5

x	:	2	2.2	2.4	2.6	2.8
y	:	2	5.576	9.968	15.272	21.584

b) Using divided difference formula, find the value of $\frac{dy}{dx}$ at $x = 9$ from the following data. 4

x	:	5	7	11	13	17
y	:	150	392	1452	2366	5202

SECTION – II

6. a) Evaluate $\int_0^1 \sqrt{x \log\left(\frac{1}{x}\right)} dx$. 3

b) Evaluate $\int_0^1 \sqrt{x} (1 - x^2)^{1/3} dx$. 3

c) Prove that $\int_0^a \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log\left(\frac{a}{b}\right)$ where a is parameter. 3

7. a) Trace the curve $y^2(2a - x) = x^3$. 4

b) Trace the curve $r = 3 \sin 2\theta$. 3

c) Show that the length of the parabola $y^2 = 4ax$ from the vertex to the end of the latus rectum is a $\left[\sqrt{2} + \log(1 + \sqrt{2}) \right]$. 3



8. a) Evaluate $\int_0^1 \int_0^x e^{x+y} dy dx$. **3**

b) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dx dy dz$. **3**

c) Change the order of integration and evaluate $\int_1^2 \int_1^{x^2} \left(\frac{x^2}{y} \right) dx dy$. **3**

OR

c) Evaluate $\iint (x^2 + y^2) x dx dy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$. **3**

9. a) Find the area common to the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ by double integration. **3**

b) The density of a uniform circular lamina of radius 'a' varies as the square of its density from a fixed point on the circumference of the circle $r = 2a \cos \theta$. Find the mass of Lamina. **3**

c) Calculate by double integration the volume generated by the revolution of the cardioid $r = a(1 - \cos \theta)$ about its axis of symmetry. **3**



SLR-EP – 11

Seat No.	
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Set **P**

**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
 - 4) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternatives : **14**
- 1) A civil engineer is said to play a role as structural designer if he is involved in
 - a) Preparation of contour map
 - b) Preparation of estimate
 - c) Preparation of valuation report
 - d) Preparation of stability report
 - 2) In Geodetic surveying
 - a) Principles of plane trigonometry are used
 - b) Principles of spherical trigonometry are used
 - c) Ordinary instruments are used
 - d) Line joining two points is a straight line
 - 3) The smallest division on a 30 m metallic tape is
 - a) 1 mm
 - b) 1 cm
 - c) 20 cm
 - d) 30 cm
 - 4) If fore bearing of a line PQ is S80°E and back bearing of line SP is S20°W, then included angle at station P is
 - a) 300°
 - b) 100°
 - c) 260°
 - d) None of these

P.T.O.



- 5) Reduced level of a station 'P' is 500.000 m. The staff reading observed on the station 'P' is 4.000 m (staff inverted). If the staff reading on station 'Q' is 3.000 m, then reduced level of station 'Q' will be
a) 490.000 m b) 493.000 m c) 501.000 m d) 507.000 m
- 6) Sun is source of _____ Remote Sensing System.
a) Active b) Passive c) Neutral d) All of these
- 7) As per roominess principle of building planning, a desirable ratio of length to breadth of a room is
a) 1.2 to 1.5 b) 1.6 to 3.0 c) 3.1 to 4.5 d) 4.6 to 6.0
- 8) In a gravity dam the water load is stabilised due to
a) Arch action b) R.C.C. design
c) Weight of dam d) None of the above
- 9) Rain water harvesting can be used for rain water flowing from
a) Building terrace only
b) Road side gutters only
c) Water from courtyard only
d) All the above
- 10) The lowermost layer of road is called
a) Subbase b) Subgrade c) Crown d) Base
- 11) In a single lane road the width is
a) 3.75 m b) 6 m c) 9 m d) 12 m
- 12) The most suitable transportation for door to door service is
a) Highway b) Railway c) Waterway d) Airway
- 13) For better strength and workability, the water cement ratio should not exceed
a) 0.40 to 0.55 b) 0.55 to 0.70
c) 0.70 to 0.85 d) 0.85 to 1.0
- 14) The M7.5 grade concrete is suitable for
a) Plane Cement Concrete
b) Foundation
c) Column
d) Beam
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Seat No.	
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**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
2) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

SECTION – I

2. a) Discuss the role of civil engineer. 3
b) Write a note on errors in chaining. 3
c) A chain was tested before starting of survey field and was found to be exactly 30 m. At the end of survey when it was tested again it was found to be .16 m too long. The area of plan drawn to a scale of 1 cm = 60 m was 92.50 cm². Find true area on the field. 4
3. a) State about reduced bearings. 2
b) The following bearings were observed while running a traverse ABCDA.
1) Calculate included angle.
2) At what station you suspect local attraction and by how much amount ?
3) Findout corrected bearings. 7

Line	FB	BB
AB	44° 30'	226° 30'
BC	124° 30'	303° 30'
CD	181°	1°
DA	289° 30'	108° 45'



4. a) Write down importance of water management. **3**
b) Prove that local attraction does not affect included angle. **3**
c) Enlist different types of Bench Marks and write their suitability. **3**
5. a) Write down any two characteristics of contour maps. **2**
b) The following consecutive readings were taken on a levelling staff with dumpy level. 3.865, 3.345, 2.930, 1.955, 0.865, 3.795, 2.635, 1.540, 1.925, 0.865 and 0.660. The instrument was shifted after taking fifth and eighth reading. The first reading was taken on BM of RL 150.25 m. Calculate reduced levels of all points using Rise and Fall method. **7**

SECTION – II

6. a) Differentiate between load bearing structure and framed structure. **4**
b) A residential plot is of 25 m × 25 m. A three storey building consisting of G.F. + 2 floors is proposed. How much area you can construct on each floor with FSI 1.6 ? Front and rear margins 3m and side margin 2.5 m. **6**
7. a) Explain building byelaws in accordance with building line and space requirement. **4**
b) Enlist principles of planning. Discuss any two principles with sketch. **5**
8. a) Write down different types of concrete with their suitability. **4**
b) With neat sketch explain any two types of shallow foundation. **5**
9. a) Write a note on “Rain Water Harvesting”. **4**
b) Discuss the concept of “Green House Building”. **5**
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SLR-EP – 11

Seat No.	
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Q

**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
 - 4) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternatives :

14

- 1) In a gravity dam the water load is stabilised due to
 - a) Arch action
 - b) R.C.C. design
 - c) Weight of dam
 - d) None of the above
- 2) Rain water harvesting can be used for rain water flowing from
 - a) Building terrace only
 - b) Road side gutters only
 - c) Water from courtyard only
 - d) All the above
- 3) The lowermost layer of road is called
 - a) Subbase
 - b) Subgrade
 - c) Crown
 - d) Base
- 4) In a single lane road the width is
 - a) 3.75 m
 - b) 6 m
 - c) 9 m
 - d) 12 m
- 5) The most suitable transportation for door to door service is
 - a) Highway
 - b) Railway
 - c) Waterway
 - d) Airway
- 6) For better strength and workability, the water cement ratio should not exceed
 - a) 0.40 to 0.55
 - b) 0.55 to 0.70
 - c) 0.70 to 0.85
 - d) 0.85 to 1.0

P.T.O.



- 7) The M7.5 grade concrete is suitable for
- Plane Cement Concrete
 - Foundation
 - Column
 - Beam
- 8) A civil engineer is said to play a role as structural designer if he is involved in
- Preparation of contour map
 - Preparation of estimate
 - Preparation of valuation report
 - Preparation of stability report
- 9) In Geodetic surveying
- Principles of plane trigonometry are used
 - Principles of spherical trigonometry are used
 - Ordinary instruments are used
 - Line joining two points is a straight line
- 10) The smallest division on a 30 m metallic tape is
- | | |
|----------|----------|
| a) 1 mm | b) 1 cm |
| c) 20 cm | d) 30 cm |
- 11) If fore bearing of a line PQ is $S80^{\circ}E$ and back bearing of line SP is $S20^{\circ}W$, then included angle at station P is
- | | |
|------------------|------------------|
| a) 300° | b) 100° |
| c) 260° | d) None of these |
- 12) Reduced level of a station 'P' is 500.000 m. The staff reading observed on the station 'P' is 4.000 m (staff inverted). If the staff reading on station 'Q' is 3.000 m, then reduced level of station 'Q' will be
- | | | | |
|--------------|--------------|--------------|--------------|
| a) 490.000 m | b) 493.000 m | c) 501.000 m | d) 507.000 m |
|--------------|--------------|--------------|--------------|
- 13) Sun is source of _____ Remote Sensing System.
- | | | | |
|-----------|------------|------------|-----------------|
| a) Active | b) Passive | c) Neutral | d) All of these |
|-----------|------------|------------|-----------------|
- 14) As per roominess principle of building planning, a desirable ratio of length to breadth of a room is
- | | | | |
|---------------|---------------|---------------|---------------|
| a) 1.2 to 1.5 | b) 1.6 to 3.0 | c) 3.1 to 4.5 | d) 4.6 to 6.0 |
|---------------|---------------|---------------|---------------|
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**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
2) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

SECTION – I

2. a) Discuss the role of civil engineer. **3**
b) Write a note on errors in chaining. **3**
c) A chain was tested before starting of survey field and was found to be exactly 30 m. At the end of survey when it was tested again it was found to be .16 m too long. The area of plan drawn to a scale of 1 cm = 60 m was 92.50 cm². Find true area on the field. **4**
3. a) State about reduced bearings. **2**
b) The following bearings were observed while running a traverse ABCDA.
1) Calculate included angle.
2) At what station you suspect local attraction and by how much amount ?
3) Findout corrected bearings. **7**

Line	FB	BB
AB	44° 30'	226° 30'
BC	124° 30'	303° 30'
CD	181°	1°
DA	289° 30'	108° 45'



4. a) Write down importance of water management. **3**
b) Prove that local attraction does not affect included angle. **3**
c) Enlist different types of Bench Marks and write their suitability. **3**
5. a) Write down any two characteristics of contour maps. **2**
b) The following consecutive readings were taken on a levelling staff with dumpy level. 3.865, 3.345, 2.930, 1.955, 0.865, 3.795, 2.635, 1.540, 1.925, 0.865 and 0.660. The instrument was shifted after taking fifth and eighth reading. The first reading was taken on BM of RL 150.25 m. Calculate reduced levels of all points using Rise and Fall method. **7**

SECTION – II

6. a) Differentiate between load bearing structure and framed structure. **4**
b) A residential plot is of 25 m × 25 m. A three storey building consisting of G.F. + 2 floors is proposed. How much area you can construct on each floor with FSI 1.6 ? Front and rear margins 3m and side margin 2.5 m. **6**
7. a) Explain building byelaws in accordance with building line and space requirement. **4**
b) Enlist principles of planning. Discuss any two principles with sketch. **5**
8. a) Write down different types of concrete with their suitability. **4**
b) With neat sketch explain any two types of shallow foundation. **5**
9. a) Write a note on “Rain Water Harvesting”. **4**
b) Discuss the concept of “Green House Building”. **5**
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SLR-EP – 11

Seat No.	
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Set **R**

**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
- 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
- 3) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
- 4) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternatives : **14**
- 1) Reduced level of a station 'P' is 500.000 m. The staff reading observed on the station 'P' is 4.000 m (staff inverted). If the staff reading on station 'Q' is 3.000 m, then reduced level of station 'Q' will be
a) 490.000 m b) 493.000 m c) 501.000 m d) 507.000 m
 - 2) Sun is source of _____ Remote Sensing System.
a) Active b) Passive c) Neutral d) All of these
 - 3) As per roominess principle of building planning, a desirable ratio of length to breadth of a room is
a) 1.2 to 1.5 b) 1.6 to 3.0 c) 3.1 to 4.5 d) 4.6 to 6.0
 - 4) In a gravity dam the water load is stabilised due to
a) Arch action b) R.C.C. design
c) Weight of dam d) None of the above
 - 5) Rain water harvesting can be used for rain water flowing from
a) Building terrace only
b) Road side gutters only
c) Water from courtyard only
d) All the above

P.T.O.



- 6) The lowermost layer of road is called
a) Subbase b) Subgrade c) Crown d) Base
- 7) In a single lane road the width is
a) 3.75 m b) 6 m c) 9 m d) 12 m
- 8) The most suitable transportation for door to door service is
a) Highway b) Railway c) Waterway d) Airway
- 9) For better strength and workability, the water cement ratio should not exceed
a) 0.40 to 0.55 b) 0.55 to 0.70
c) 0.70 to 0.85 d) 0.85 to 1.0
- 10) The M7.5 grade concrete is suitable for
a) Plane Cement Concrete
b) Foundation
c) Column
d) Beam
- 11) A civil engineer is said to play a role as structural designer if he is involved in
a) Preparation of contour map
b) Preparation of estimate
c) Preparation of valuation report
d) Preparation of stability report
- 12) In Geodetic surveying
a) Principles of plane trigonometry are used
b) Principles of spherical trigonometry are used
c) Ordinary instruments are used
d) Line joining two points is a straight line
- 13) The smallest division on a 30 m metallic tape is
a) 1 mm b) 1 cm
c) 20 cm d) 30 cm
- 14) If fore bearing of a line PQ is $S80^\circ E$ and back bearing of line SP is $S20^\circ W$, then included angle at station P is
a) 300° b) 100°
c) 260° d) None of these
-



Seat No.	
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**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
2) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

SECTION – I

2. a) Discuss the role of civil engineer. 3
b) Write a note on errors in chaining. 3
c) A chain was tested before starting of survey field and was found to be exactly 30 m. At the end of survey when it was tested again it was found to be .16 m too long. The area of plan drawn to a scale of 1 cm = 60 m was 92.50 cm². Find true area on the field. 4
3. a) State about reduced bearings. 2
b) The following bearings were observed while running a traverse ABCDA.
1) Calculate included angle.
2) At what station you suspect local attraction and by how much amount ?
3) Findout corrected bearings. 7

Line	FB	BB
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CD	181°	1°
DA	289° 30'	108° 45'



4. a) Write down importance of water management. **3**
b) Prove that local attraction does not affect included angle. **3**
c) Enlist different types of Bench Marks and write their suitability. **3**
5. a) Write down any two characteristics of contour maps. **2**
b) The following consecutive readings were taken on a levelling staff with dumpy level. 3.865, 3.345, 2.930, 1.955, 0.865, 3.795, 2.635, 1.540, 1.925, 0.865 and 0.660. The instrument was shifted after taking fifth and eighth reading. The first reading was taken on BM of RL 150.25 m. Calculate reduced levels of all points using Rise and Fall method. **7**

SECTION – II

6. a) Differentiate between load bearing structure and framed structure. **4**
b) A residential plot is of 25 m × 25 m. A three storey building consisting of G.F. + 2 floors is proposed. How much area you can construct on each floor with FSI 1.6 ? Front and rear margins 3m and side margin 2.5 m. **6**
7. a) Explain building byelaws in accordance with building line and space requirement. **4**
b) Enlist principles of planning. Discuss any two principles with sketch. **5**
8. a) Write down different types of concrete with their suitability. **4**
b) With neat sketch explain any two types of shallow foundation. **5**
9. a) Write a note on “Rain Water Harvesting”. **4**
b) Discuss the concept of “Green House Building”. **5**
-



SLR-EP – 11

Seat No.	
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Set **S**

**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
 - 3) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
 - 4) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternatives : **14**
- 1) The lowermost layer of road is called
a) Subbase b) Subgrade c) Crown d) Base
 - 2) In a single lane road the width is
a) 3.75 m b) 6 m c) 9 m d) 12 m
 - 3) The most suitable transportation for door to door service is
a) Highway b) Railway c) Waterway d) Airway
 - 4) For better strength and workability, the water cement ratio should not exceed
a) 0.40 to 0.55 b) 0.55 to 0.70
c) 0.70 to 0.85 d) 0.85 to 1.0
 - 5) The M7.5 grade concrete is suitable for
a) Plane Cement Concrete b) Foundation
c) Column d) Beam
 - 6) A civil engineer is said to play a role as structural designer if he is involved in
a) Preparation of contour map
b) Preparation of estimate
c) Preparation of valuation report
d) Preparation of stability report

P.T.O.



- 7) In Geodetic surveying
- Principles of plane trigonometry are used
 - Principles of spherical trigonometry are used
 - Ordinary instruments are used
 - Line joining two points is a straight line
- 8) The smallest division on a 30 m metallic tape is
- 1 mm
 - 1 cm
 - 20 cm
 - 30 cm
- 9) If fore bearing of a line PQ is $S80^\circ E$ and back bearing of line SP is $S20^\circ W$, then included angle at station P is
- 300°
 - 100°
 - 260°
 - None of these
- 10) Reduced level of a station 'P' is 500.000 m. The staff reading observed on the station 'P' is 4.000 m (staff inverted). If the staff reading on station 'Q' is 3.000 m, then reduced level of station 'Q' will be
- 490.000 m
 - 493.000 m
 - 501.000 m
 - 507.000 m
- 11) Sun is source of _____ Remote Sensing System.
- Active
 - Passive
 - Neutral
 - All of these
- 12) As per roominess principle of building planning, a desirable ratio of length to breadth of a room is
- 1.2 to 1.5
 - 1.6 to 3.0
 - 3.1 to 4.5
 - 4.6 to 6.0
- 13) In a gravity dam the water load is stabilised due to
- Arch action
 - R.C.C. design
 - Weight of dam
 - None of the above
- 14) Rain water harvesting can be used for rain water flowing from
- Building terrace only
 - Road side gutters only
 - Water from courtyard only
 - All the above
-



Seat No.	
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**F.E. (Part – II) (New CGPA Pattern) Examination, 2016
BASIC CIVIL ENGINEERING**

Day and Date : Tuesday, 22-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Q. No. 2 is **compulsory** in Section – I. Solve **any two** questions from Q. No. 3 to Q. No. 5.
2) Q. No. 6 is **compulsory** in Section – II. Solve **any two** questions from Q. No. 7 to Q. No. 9.

SECTION – I

- 2. a) Discuss the role of civil engineer. 3
- b) Write a note on errors in chaining. 3
- c) A chain was tested before starting of survey field and was found to be exactly 30 m. At the end of survey when it was tested again it was found to be .16 m too long. The area of plan drawn to a scale of 1 cm = 60 m was 92.50 cm². Find true area on the field. 4
- 3. a) State about reduced bearings. 2
- b) The following bearings were observed while running a traverse ABCDA.
 - 1) Calculate included angle.
 - 2) At what station you suspect local attraction and by how much amount ?
 - 3) Findout corrected bearings. 7

Line	FB	BB
AB	44° 30'	226° 30'
BC	124° 30'	303° 30'
CD	181°	1°
DA	289° 30'	108° 45'



4. a) Write down importance of water management. **3**
b) Prove that local attraction does not affect included angle. **3**
c) Enlist different types of Bench Marks and write their suitability. **3**
5. a) Write down any two characteristics of contour maps. **2**
b) The following consecutive readings were taken on a levelling staff with dumpy level. 3.865, 3.345, 2.930, 1.955, 0.865, 3.795, 2.635, 1.540, 1.925, 0.865 and 0.660. The instrument was shifted after taking fifth and eighth reading. The first reading was taken on BM of RL 150.25 m. Calculate reduced levels of all points using Rise and Fall method. **7**

SECTION – II

6. a) Differentiate between load bearing structure and framed structure. **4**
b) A residential plot is of 25 m × 25 m. A three storey building consisting of G.F. + 2 floors is proposed. How much area you can construct on each floor with FSI 1.6 ? Front and rear margins 3m and side margin 2.5 m. **6**
7. a) Explain building byelaws in accordance with building line and space requirement. **4**
b) Enlist principles of planning. Discuss any two principles with sketch. **5**
8. a) Write down different types of concrete with their suitability. **4**
b) With neat sketch explain any two types of shallow foundation. **5**
9. a) Write a note on “Rain Water Harvesting”. **4**
b) Discuss the concept of “Green House Building”. **5**
-



Seat No.	
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Set P

F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in first **30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to **right** indicate **full** marks.
4) Assume data **if needed**.
5) **All** questions are **compulsory**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I
(Basic Electronics)

1. Choose the correct answer :

7

- 1) LVDT has _____ primary winding and _____ secondary winding.
a) one, two b) two, one c) one, one d) two, two
- 2) The terminal taken out from p-type of layer in p-n junction diode is called
a) cathode b) anode c) emitter d) base
- 3) Colour bands on resistor are brown, black black, gold its value is
a) $10\ \Omega \pm 5\%$ b) $10\ \Omega \pm 10\%$ c) $100\ \Omega \pm 5\%$ d) $100\ \Omega \pm 10\%$
- 4) Solar cell is a _____ transducer.
a) active b) passive c) resistive d) inductive
- 5) 1's compliment of 0101 is
a) 1010 b) 1011 c) 1111 d) 0000
- 6) Example of electro-mechanical switch is
a) toggle switch b) band switch
c) push button switch d) relay
- 7) Zener diode can be used as
a) regulator b) filter c) amplifier d) oscillator



SECTION – II
(Computer Programming)

8) Which of the following is the valid C variable name ?

- a) for b) 1 st c) var name d) Num 1

9) Find out the invalid mathematical statement in C.

- a) $area = 1/2 * base * height;$ b) $area = 3.14 * r * r;$
c) $slope = (y_2 - y_1) \div (x_2 - x_1);$ d) $si = p * r * n / 100;$

10) What is the difference between the 4's in the following two expressions ?

`int num [4] ;`

`num [4] = 20 ;`

- a) First is particular element, second is type
b) First is array size, second is particular element
c) First is particular element, second is array size
d) First is array size, second is invalid statement

11) What is the output of the following statement ?

`printf (" \Hello\ Good\'morning\' ") ;`

- a) `\Hello\ Good\'morning\'` b) `\Hello\Good \'morning\'`
c) `"Hello" Good \'morning\'` d) Error in the statement

12) Union stud

```
{  
    char name [10] ;  
  
    int rno ;  
  
    float percent ;  
  
} s1 ;
```

How many memory bytes are allocated for the variable s1 ?

- a) 2 b) 4 c) 10 d) 16

13) _____ symbol is used to represent the flow of program in flow chart.

- a) Square b) Rectangle c) Rhombus d) Arrow

14) The output of the following is :

`char x = 'a'`

`printf ("%d", x) ;`

- a) 'a' b) 97 c) A d) Error



Seat No.	
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**F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** 1) *Figures to **right** indicate **full** marks.*
2) *Assume data **if needed**.*
3) ***All** questions are **compulsory**.*

SECTION – I
(Basic Electronics)

2. Solve **any four** : **(4×4=16)**
- a) Draw and explain transistor as an amplifier.
 - b) Explain photo-electric pickup in detail.
 - c) Explain relay (electromechanical switch).
 - d) Draw and explain construction of aluminium electrolytic capacitor.
 - e) Draw and explain half wave rectifier with suitable waveforms.
3. Solve **any two** : **(2×6=12)**
- a) State and prove Demorgaon's theorem and write the Boolean equation for NAND, NOR, EX-OR and EX-NOR gate.
 - b) Explain thermo couple and how temp. is measured using thermo couple and explain its types.
 - c) Draw experimental setup for V-I characteristics of common emitter configuration and explain input output characteristics.

SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What are the logical operators used in C ? Explain their use with example.
 - b) Find out the errors in the following program and rewrite the corrected program code again.

```
void main ()  
{  
    int x = 30, y = 40 ;  
    if (x = y)  
        print (" x is equal to y\n") ;  
    elseif (x > y)  
        printf (" x is greater than y\n") ;  
    elseif (x < y)  
        printf (" x is smaller than y\n") ;  
}
```
 - c) Explain structure and union with similarity and differences.



d) Write the output of the following program and explain.

```
#include<stdio.h>
void main ()
{
    int x = 6, y = 0, z ;
    while (x>=0)
    {
        if (x==y)
            break ;
        else
            printf ("%d %d\n", x, y) ;
        x-- ;
        y++;
    }
}
```

e) Write the output of the following program with the reason for the output.

```
#include<stdio.h>
void fun (int*, int*);
void main ()
{
    int i = 5, j = 2 ;
    printf ("%d %d\n", i, j) ;
    fun (&i, &j) ;
    printf ("%d %d\n", i, j) ;
}
void fun (int * i, int * j)
{
    *j = *i * *i ;
    *j = *j * *j ;
}
```

5. Attempt **any two** :

(2×6=12)

- a) What is do-while loop ? Elaborate with its syntax, use and example program code part.
- b) Write a program to read three subjects marks and display the result as Distinction/ First class/ Second class/ Pass class/Fail according to the calculated percentage.
- c) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1×2×3×4 = 24).



Seat No.	
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Set Q

F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in first **30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to **right** indicate **full** marks.
4) Assume data **if needed**.
5) **All** questions are **compulsory**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

(Basic Electronics)

1. Choose the correct answer :

7

- 1) Colour bands on resistor are brown, black black, gold its value is
a) $10\ \Omega \pm 5\%$ b) $10\ \Omega \pm 10\%$ c) $100\ \Omega \pm 5\%$ d) $100\ \Omega \pm 10\%$
- 2) Solar cell is a _____ transducer.
a) active b) passive c) resistive d) inductive
- 3) 1's compliment of 0101 is
a) 1010 b) 1011 c) 1111 d) 0000
- 4) Example of electro-mechanical switch is
a) toggle switch b) band switch
c) push button switch d) relay
- 5) Zener diode can be used as
a) regulator b) filter c) amplifier d) oscillator
- 6) LVDT has _____ primary winding and _____ secondary winding.
a) one, two b) two, one c) one, one d) two, two
- 7) The terminal taken out from p-type of layer in p-n junction diode is called
a) cathode b) anode c) emitter d) base

P.T.O.



SECTION – II
(Computer Programming)

8) What is the difference between the 4's in the following two expressions ?

```
int num [4] ;
```

```
num [4] = 20 ;
```

- a) First is particular element, second is type
- b) First is array size, second is particular element
- c) First is particular element, second is array size
- d) First is array size, second is invalid statement

9) What is the output of the following statement ?

```
printf (" \"Hello\" Good\\'morning\\' ") ;
```

- a) \"Hello\" Good\\'morning\\'
- b) \\Hello\\Good 'morning'
- c) "Hello" Good 'morning'
- d) Error in the statement

10) Union stud

```
{  
    char name [10] ;  
  
    int rno ;  
  
    float percent ;  
  
} s1 ;
```

How many memory bytes are allocated for the variable s1 ?

- a) 2
- b) 4
- c) 10
- d) 16

11) _____ symbol is used to represent the flow of program in flow chart.

- a) Square
- b) Rectangle
- c) Rhombus
- d) Arrow

12) The output of the following is :

```
char x = 'a'
```

```
printf ("%d", x) ;
```

- a) 'a'
- b) 97
- c) A
- d) Error

13) Which of the following is the valid C variable name ?

- a) for
- b) 1 st
- c) var name
- d) Num 1

14) Find out the invalid mathematical statement in C.

- a) $area = 1/2 * base * height;$
- b) $area = 3.14 * r * r;$
- c) $slope = (y_2 - y_1) \div (x_2 - x_1);$
- d) $si = p * r * n / 100;$



Seat No.	
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**F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** 1) *Figures to **right** indicate **full** marks.*
2) *Assume data **if needed**.*
3) ***All** questions are **compulsory**.*

SECTION – I
(Basic Electronics)

2. Solve **any four** : **(4×4=16)**
- a) Draw and explain transistor as an amplifier.
 - b) Explain photo-electric pickup in detail.
 - c) Explain relay (electromechanical switch).
 - d) Draw and explain construction of aluminium electrolytic capacitor.
 - e) Draw and explain half wave rectifier with suitable waveforms.
3. Solve **any two** : **(2×6=12)**
- a) State and prove Demorgaon's theorem and write the Boolean equation for NAND, NOR, EX-OR and EX-NOR gate.
 - b) Explain thermo couple and how temp. is measured using thermo couple and explain its types.
 - c) Draw experimental setup for V-I characteristics of common emitter configuration and explain input output characteristics.

SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What are the logical operators used in C ? Explain their use with example.
 - b) Find out the errors in the following program and rewrite the corrected program code again.
void main ()
{
 int x = 30, y = 40 ;
 if (x = y)
 print (" x is equal to y\n") ;
 elseif (x > y)
 printf (" x is greater than y\n") ;
 elseif (x < y)
 printf (" x is smaller than y\n") ;
}
 - c) Explain structure and union with similarity and differences.



d) Write the output of the following program and explain.

```
#include<stdio.h>
void main ()
{
    int x = 6, y = 0, z ;
    while (x>=0)
    {
        if (x==y)
            break ;
        else
            printf ("%d %d\n", x, y) ;
        x-- ;
        y++;
    }
}
```

e) Write the output of the following program with the reason for the output.

```
#include<stdio.h>
void fun (int*, int*);
void main ()
{
    int i = 5, j = 2 ;
    printf ("%d %d\n", i, j) ;
    fun (&i, &j) ;
    printf ("%d %d\n", i, j) ;
}
void fun (int * i, int * j)
{
    *j = *i * *i ;
    *j = *j * *j ;
}
```

5. Attempt **any two** :

(2×6=12)

- a) What is do-while loop ? Elaborate with its syntax, use and example program code part.
- b) Write a program to read three subjects marks and display the result as Distinction/ First class/ Second class/ Pass class/Fail according to the calculated percentage.
- c) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1×2×3×4 = 24).



Seat No.	
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Set R

F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in first **30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to **right** indicate **full** marks.
4) **Assume data if needed.**
5) **All questions are compulsory.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

(Basic Electronics)

1. Choose the correct answer :

7

- 1) 1's compliment of 0101 is
a) 1010 b) 1011 c) 1111 d) 0000
- 2) Example of electro-mechanical switch is
a) toggle switch b) band switch
c) push button switch d) relay
- 3) Zener diode can be used as
a) regulator b) filter c) amplifier d) oscillator
- 4) LVDT has _____ primary winding and _____ secondary winding.
a) one, two b) two, one c) one, one d) two, two
- 5) The terminal taken out from p-type of layer in p-n junction diode is called
a) cathode b) anode c) emitter d) base
- 6) Colour bands on resistor are brown, black black, gold its value is
a) $10 \Omega \pm 5\%$ b) $10 \Omega \pm 10\%$ c) $100 \Omega \pm 5\%$ d) $100 \Omega \pm 10\%$
- 7) Solar cell is a _____ transducer.
a) active b) passive c) resistive d) inductive

P.T.O.



SECTION – II
(Computer Programming)

8) Union stud

```
{  
    char name [10] ;  
    int rno ;  
    float percent ;  
} s1 ;
```

How many memory bytes are allocated for the variable s1 ?

- a) 2 b) 4 c) 10 d) 16

9) _____ symbol is used to represent the flow of program in flow chart.

- a) Square b) Rectangle c) Rhombus d) Arrow

10) The output of the following is :

```
char x = 'a'  
printf ("%d", x) ;
```

- a) 'a' b) 97 c) A d) Error

11) Which of the following is the valid C variable name ?

- a) for b) 1 st c) var name d) Num 1

12) Find out the invalid mathematical statement in C.

- a) $area = 1/2 * base * height;$ b) $area = 3.14 * r * r;$
c) $slope = (y_2 - y_1) \div (x_2 - x_1);$ d) $si = p * r * n / 100;$

13) What is the difference between the 4's in the following two expressions ?

```
int num [4] ;  
num [4] = 20 ;
```

- a) First is particular element, second is type
b) First is array size, second is particular element
c) First is particular element, second is array size
d) First is array size, second is invalid statement

14) What is the output of the following statement ?

```
printf (" \"Hello\" Good \"morning\" ");
```

- a) \"Hello\" Good \"morning\" b) \Hello\Good 'morning'
c) "Hello" Good 'morning' d) Error in the statement



Seat No.	
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F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** 1) Figures to **right** indicate **full** marks.
2) Assume data **if needed**.
3) **All** questions are **compulsory**.

SECTION – I
(Basic Electronics)

2. Solve **any four** : (4×4=16)
- a) Draw and explain transistor as an amplifier.
 - b) Explain photo-electric pickup in detail.
 - c) Explain relay (electromechanical switch).
 - d) Draw and explain construction of aluminium electrolytic capacitor.
 - e) Draw and explain half wave rectifier with suitable waveforms.
3. Solve **any two** : (2×6=12)
- a) State and prove Demorgaon's theorem and write the Boolean equation for NAND, NOR, EX-OR and EX-NOR gate.
 - b) Explain thermo couple and how temp. is measured using thermo couple and explain its types.
 - c) Draw experimental setup for V-I characteristics of common emitter configuration and explain input output characteristics.

SECTION – II
(Computer Programming)

4. Attempt **any four** : (4×4=16)
- a) What are the logical operators used in C ? Explain their use with example.
 - b) Find out the errors in the following program and rewrite the corrected program code again.
void main ()
{
 int x = 30, y = 40 ;
 if (x = y)
 print (" x is equal to y\n") ;
 elseif (x > y)
 printf (" x is greater than y\n") ;
 elseif (x < y)
 printf (" x is smaller than y\n") ;
}
 - c) Explain structure and union with similarity and differences.



d) Write the output of the following program and explain.

```
#include<stdio.h>
void main ()
{
    int x = 6, y = 0, z ;
    while (x>=0)
    {
        if (x==y)
            break ;
        else
            printf ("%d %d\n", x, y) ;
        x-- ;
        y++;
    }
}
```

e) Write the output of the following program with the reason for the output.

```
#include<stdio.h>
void fun (int*, int*);
void main ()
{
    int i = 5, j = 2 ;
    printf ("%d %d\n", i, j) ;
    fun (&i, &j) ;
    printf ("%d %d\n", i, j) ;
}
void fun (int * i, int * j)
{
    *j = *i * *i ;
    *j = *j * *j ;
}
```

5. Attempt **any two** :

(2×6=12)

- a) What is do-while loop ? Elaborate with its syntax, use and example program code part.
- b) Write a program to read three subjects marks and display the result as Distinction/ First class/ Second class/ Pass class/Fail according to the calculated percentage.
- c) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1×2×3×4 = 24).



Seat No.	
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Set	S
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F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in first **30 minutes** in Answer Book Page No. 3. Each question carries **one** mark.
2) Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.
3) Figures to **right** indicate **full** marks.
4) Assume data **if needed**.
5) **All** questions are **compulsory**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

(Basic Electronics)

1. Choose the correct answer :

7

- 1) Zener diode can be used as
a) regulator b) filter c) amplifier d) oscillator
- 2) LVDT has _____ primary winding and _____ secondary winding.
a) one, two b) two, one c) one, one d) two, two
- 3) The terminal taken out from p-type of layer in p-n junction diode is called
a) cathode b) anode c) emitter d) base
- 4) Colour bands on resistor are brown, black black, gold its value is
a) $10 \Omega \pm 5\%$ b) $10 \Omega \pm 10\%$ c) $100 \Omega \pm 5\%$ d) $100 \Omega \pm 10\%$
- 5) Solar cell is a _____ transducer.
a) active b) passive c) resistive d) inductive
- 6) 1's compliment of 0101 is
a) 1010 b) 1011 c) 1111 d) 0000
- 7) Example of electro-mechanical switch is
a) toggle switch b) band switch
c) push button switch d) relay

P.T.O.



SECTION – II
(Computer Programming)

8) The output of the following is :

```
char x = 'a'  
printf ("%d", x);
```

- a) 'a' b) 97 c) A d) Error

9) Which of the following is the valid C variable name ?

- a) for b) 1 st c) var name d) Num 1

10) Find out the invalid mathematical statement in C.

- a) $area = 1/2 * base * height;$ b) $area = 3.14 * r * r;$
c) $slope = (y_2 - y_1) \div (x_2 - x_1);$ d) $si = p * r * n / 100;$

11) What is the difference between the 4's in the following two expressions ?

```
int num [4] ;  
num [4] = 20 ;
```

- a) First is particular element, second is type
b) First is array size, second is particular element
c) First is particular element, second is array size
d) First is array size, second is invalid statement

12) What is the output of the following statement ?

```
printf (" \"Hello\" Good \"morning\" ");
```

- a) \"Hello\" Good \"morning\" b) \Hello\Good 'morning'
c) "Hello" Good 'morning' d) Error in the statement

13) Union stud

```
{  
char name [10] ;  
int rno ;  
float percent ;  
} s1 ;
```

How many memory bytes are allocated for the variable s1 ?

- a) 2 b) 4 c) 10 d) 16

14) _____ symbol is used to represent the flow of program in flow chart.

- a) Square b) Rectangle c) Rhombus d) Arrow



Seat No.	
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**F.E. (Part – II) (New) (CGPA) Examination, 2016
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Wednesday, 23-11-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** 1) *Figures to **right** indicate **full** marks.*
2) *Assume data **if needed**.*
3) ***All** questions are **compulsory**.*

SECTION – I
(Basic Electronics)

2. Solve **any four** : **(4×4=16)**
- a) Draw and explain transistor as an amplifier.
 - b) Explain photo-electric pickup in detail.
 - c) Explain relay (electromechanical switch).
 - d) Draw and explain construction of aluminium electrolytic capacitor.
 - e) Draw and explain half wave rectifier with suitable waveforms.
3. Solve **any two** : **(2×6=12)**
- a) State and prove Demorgaon's theorem and write the Boolean equation for NAND, NOR, EX-OR and EX-NOR gate.
 - b) Explain thermo couple and how temp. is measured using thermo couple and explain its types.
 - c) Draw experimental setup for V-I characteristics of common emitter configuration and explain input output characteristics.

SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What are the logical operators used in C ? Explain their use with example.
 - b) Find out the errors in the following program and rewrite the corrected program code again.

```
void main ()  
{  
    int x = 30, y = 40 ;  
    if (x = y)  
        print (" x is equal to y\n") ;  
    elseif (x > y)  
        printf (" x is greater than y\n") ;  
    elseif (x < y)  
        printf (" x is smaller than y\n") ;  
}
```
 - c) Explain structure and union with similarity and differences.



d) Write the output of the following program and explain.

```
#include<stdio.h>
void main ()
{
    int x = 6, y = 0, z ;
    while (x>=0)
    {
        if (x==y)
            break ;
        else
            printf ("%d %d\n", x, y) ;
        x-- ;
        y++;
    }
}
```

e) Write the output of the following program with the reason for the output.

```
#include<stdio.h>
void fun (int*, int*);
void main ()
{
    int i = 5, j = 2 ;
    printf ("%d %d\n", i, j) ;
    fun (&i, &j) ;
    printf ("%d %d\n", i, j) ;
}
void fun (int * i, int * j)
{
    *j = *i * *i ;
    *j = *j * *j ;
}
```

5. Attempt **any two** :

(2×6=12)

- a) What is do-while loop ? Elaborate with its syntax, use and example program code part.
- b) Write a program to read three subjects marks and display the result as Distinction/ First class/ Second class/ Pass class/Fail according to the calculated percentage.
- c) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1×2×3×4 = 24).



SLR-EP – 14

Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, **if necessary**.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}$ /k.mol.
 - 2) Velocity of light, $c = 3 \times 10^8$ m/sec.
 - 3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) The waves used in Sonography are
 - a) Microwaves
 - b) Infrared waves
 - c) Ultraviolet waves
 - d) Ultrasonic waves
- 2) The length of the rod moving with velocity v relative to the observer is same when
 - a) $v = 0$
 - b) v is comparable to c
 - c) $v \geq c$
 - d) $v \ll c$
- 3) An p-type semiconductor is
 - a) Positively charged
 - b) Negatively charged
 - c) Electrically neutral
 - d) None of the above
- 4) Classify the following unit cell into proper crystal system
 $a = 1.08$ nm, $b = 0.947$ nm, $c = 0.52$ nm with $\alpha = 41^\circ$, $\beta = 82^\circ$ and $\gamma = 95^\circ$.
 - a) Triclinic
 - b) Orthorhombic
 - c) Monoclinic
 - d) Hexagonal
- 5) The ultrasonic waves exhibit
 - a) Large diffraction effect
 - b) Negligible diffraction effect
 - c) Very long wavelength
 - d) Faster speed than light waves

P.T.O.



- 6) The conductivity of a material is
- a) $\sigma = \rho.e.\mu$ b) $\mu.\sigma = \rho.e$
- c) $\sigma = \rho.e / \rho.\mu$ d) $\sigma = R_{H,\mu}$
- 7) Choose the incorrect statement concerning the theory of relativity
- a) Velocity of light is independent of motion
- b) It proves the existence of the ether of the observer
- c) Time is relative
- d) There is variation of mass with velocity
- 8) To find prominent diffraction, the size of the diffraction objects should be
- a) greater than the wavelength of light used
- b) of the order of wavelength of light
- c) less than the wavelength of light
- d) none of these
- 9) A calcite crystal is a
- a) Uniaxial crystal b) Biaxial crystal
- c) Positive crystal d) Opaque crystal
- 10) Holography means
- a) To get 2D image of 3D object b) To get zero dimension image
- c) To get 3D image of 3D object d) To get 3D image of 2D object
- 11) If d is the core diameter of the fiber, then V-number is given by
- a) $V = \frac{\pi d}{\lambda} \sqrt{n_1^2 - n_2^2}$ b) $V = \frac{\pi d}{\lambda} \sqrt{n_2^2 - n_1^2}$
- c) $V = \frac{2\pi d}{\lambda} \sqrt{n_1^2 - n_2^2}$ d) $V = \frac{2\pi d}{\lambda} \sqrt{n_2^2 - n_1^2}$
- 12) The optical fiber has $n_1 = 1.45$ and $n_2 = 1.40$. The critical angle of the fiber is
- a) $73^\circ 45'$ b) $75^\circ 45'$
- c) $72^\circ 54'$ d) $74^\circ 54'$
- 13) Nuclear Fission reaction is
- a) Combination of two light nuclei, to form heavy and stable nucleus
- b) Division of heavy nucleus into approximately two equal parts
- c) Disintegration of nuclei into unstable nucleus
- d) Thermonuclear reaction
- 14) Multi Wall Carbon Nanotubes (MWCNT) have diameters ranging from
- a) 2 to 25 nm b) 5 to 25 nm
- c) 2 to 50 nm d) 20 to 25 nm
-



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
2) Figures to the **right** indicate **full marks**.

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}$ /k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

SECTION – I

2. Attempt **any five** of the following : 15
- a) Explain Bragg's law.
 - b) Explain the principle of :
 - i) Magnetostriction method
 - ii) Piezo electric method.
 - c) Explain Time dilation.
 - d) The lattice constant for BCC iron at 20°C is 2.85 A.U. The density of an iron is 7870 kg/m³. Calculate its atomic mass.
 - e) Classify the solids into insulator, semiconductor and conductor on the basis of band theory of solids.
 - f) A specimen of aluminum has 6×10^{-5} m thickness. A current of 10 A flows through it and a magnetic field of induction 1.45 T is applied perpendicular to the current direction. Determine the concentration of charge carrier in the material when developed Hall voltage is 10μ V.
 - g) Write properties of ultrasonic waves.

3. Show that in cubic crystal the spacing between consecutive parallel planes of Miller indices (h k l) is given by : 5

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}} .$$

OR

Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.



4. Attempt **any two** of the following : 8
- a) Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) Define atomic radius. Find the relation between lattice constant and atomic radius for BCC and FCC.
 - c) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - d) Deduce Einstein's expression for mass-energy equivalence.

SECTION – II

5. Attempt **any five** of the following : 15
- a) Distinguish between Fresnel diffraction and Fraunhofer diffraction.
 - b) Calculate the specific rotation if the plane of polarization is turned through $26^\circ 15'$ travelling 20 cm length of 20% sugar solution.
 - c) Define :
 - 1) Stimulated emission
 - 2) Spontaneous emission.
 - d) Explain types of carbon nanotubes depending on chirality.
 - e) Give applications of LASER in different fields.
 - f) The numerical aperture of fiber is 0.25 and relative refractive index is 0.02. Determine the refractive indices of the core and cladding of a fibre.
 - g) Write the advantages of optical fiber over conducting wire.
6. With neat energy transition diagram, explain He-Ne gas laser. 5

OR

Explain the design, working and function of each part of the nuclear fission reactors.

7. Attempt **any two** of the following : 8
- a) With theory, explain plane diffraction grating.
 - b) Describe Laurent's half shade polarimeter for the determination of specific rotation of the substance.
 - c) Explain :
 - i) P-P cycle
 - ii) C-N cycle.
 - d) Deduce the expression for acceptance angle of optical fiber and explain how it can be calculated with the help of fractional refractive index change.



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**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Make suitable assumptions, *if necessary*.
2) Figures to the **right** indicate **full** marks.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) To find prominent diffraction, the size of the diffraction objects should be
 - a) greater than the wavelength of light used
 - b) of the order of wavelength of light
 - c) less than the wavelength of light
 - d) none of these
- 2) A calcite crystal is a
 - a) Uniaxial crystal
 - b) Biaxial crystal
 - c) Positive crystal
 - d) Opaque crystal
- 3) Holography means
 - a) To get 2D image of 3D object
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 - c) To get 3D image of 3D object
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- 4) If d is the core diameter of the fiber, then V-number is given by
 - a) $V = \frac{\pi d}{\lambda} \sqrt{n_1^2 - n_2^2}$
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 - c) $V = \frac{2\pi d}{\lambda} \sqrt{n_1^2 - n_2^2}$
 - d) $V = \frac{2\pi d}{\lambda} \sqrt{n_2^2 - n_1^2}$



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- $73^\circ 45'$
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- 2 to 25 nm
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- 8) The waves used in Sonography are
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- 11) Classify the following unit cell into proper crystal system
 $a = 1.08$ nm, $b = 0.947$ nm, $c = 0.52$ nm with $\alpha = 41^\circ$, $\beta = 82^\circ$ and $\gamma = 95^\circ$.
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- Large diffraction effect
 - Negligible diffraction effect
 - Very long wavelength
 - Faster speed than light waves
- 13) The conductivity of a material is
- $\sigma = \rho.e.\mu$
 - $\mu.\sigma = \rho.e$
 - $\sigma = \rho.e / \rho.\mu$
 - $\sigma = R_{H,\mu}$
- 14) Choose the incorrect statement concerning the theory of relativity
- Velocity of light is independent of motion
 - It proves the existence of the ether of the observer
 - Time is relative
 - There is variation of mass with velocity
-



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**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
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Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}$ /k.mol.
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SECTION – I

2. Attempt **any five** of the following : **15**
- a) Explain Bragg's law.
 - b) Explain the principle of :
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 - ii) Piezo electric method.
 - c) Explain Time dilation.
 - d) The lattice constant for BCC iron at 20°C is 2.85 A.U. The density of an iron is 7870 kg/m³. Calculate its atomic mass.
 - e) Classify the solids into insulator, semiconductor and conductor on the basis of band theory of solids.
 - f) A specimen of aluminum has 6×10^{-5} m thickness. A current of 10 A flows through it and a magnetic field of induction 1.45 T is applied perpendicular to the current direction. Determine the concentration of charge carrier in the material when developed Hall voltage is 10μ V.
 - g) Write properties of ultrasonic waves.

3. Show that in cubic crystal the spacing between consecutive parallel planes of Miller indices (h k l) is given by : **5**

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

OR

Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.



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- Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - Define atomic radius. Find the relation between lattice constant and atomic radius for BCC and FCC.
 - State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - Deduce Einstein's expression for mass-energy equivalence.

SECTION – II

5. Attempt **any five** of the following : 15
- Distinguish between Fresnel diffraction and Fraunhofer diffraction.
 - Calculate the specific rotation if the plane of polarization is turned through $26^\circ 15'$ travelling 20 cm length of 20% sugar solution.
 - Define :
 - Stimulated emission
 - Spontaneous emission.
 - Explain types of carbon nanotubes depending on chirality.
 - Give applications of LASER in different fields.
 - The numerical aperture of fiber is 0.25 and relative refractive index is 0.02. Determine the refractive indices of the core and cladding of a fibre.
 - Write the advantages of optical fiber over conducting wire.
6. With neat energy transition diagram, explain He-Ne gas laser. 5

OR

Explain the design, working and function of each part of the nuclear fission reactors.

7. Attempt **any two** of the following : 8
- With theory, explain plane diffraction grating.
 - Describe Laurent's half shade polarimeter for the determination of specific rotation of the substance.
 - Explain :
 - P-P cycle
 - C-N cycle.
 - Deduce the expression for acceptance angle of optical fiber and explain how it can be calculated with the help of fractional refractive index change.



SLR-EP – 14

Seat No.	
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**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, **if necessary**.
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 - 3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) The ultrasonic waves exhibit
 - a) Large diffraction effect
 - b) Negligible diffraction effect
 - c) Very long wavelength
 - d) Faster speed than light waves
- 2) The conductivity of a material is
 - a) $\sigma = \rho.e.\mu$
 - b) $\mu.\sigma = \rho.e$
 - c) $\sigma = \rho.e / \rho.\mu$
 - d) $\sigma = R_H.\mu$
- 3) Choose the incorrect statement concerning the theory of relativity
 - a) Velocity of light is independent of motion
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 - a) greater than the wavelength of light used
 - b) of the order of wavelength of light
 - c) less than the wavelength of light
 - d) none of these

P.T.O.



- 5) A calcite crystal is a
- Uniaxial crystal
 - Biaxial crystal
 - Positive crystal
 - Opaque crystal
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- To get 2D image of 3D object
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 - To get 3D image of 3D object
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- 8) The optical fiber has $n_1 = 1.45$ and $n_2 = 1.40$. The critical angle of the fiber is
- $73^\circ 45'$
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 - $72^\circ 54'$
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- 9) Nuclear Fission reaction is
- Combination of two light nuclei, to form heavy and stable nucleus
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- 2 to 25 nm
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- 11) The waves used in Sonography are
- Microwaves
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- 12) The length of the rod moving with velocity v relative to the observer is same when
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 - Orthorhombic
 - Monoclinic
 - Hexagonal



Seat No.	
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**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
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3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Explain Bragg's law.
 - b) Explain the principle of :
 - i) Magnetostriction method
 - ii) Piezo electric method.
 - c) Explain Time dilation.
 - d) The lattice constant for BCC iron at 20°C is 2.85 A.U. The density of an iron is 7870 kg/m³. Calculate its atomic mass.
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OR

Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.



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- Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.
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 - State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - Deduce Einstein's expression for mass-energy equivalence.

SECTION – II

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 - Describe Laurent's half shade polarimeter for the determination of specific rotation of the substance.
 - Explain :
 - P-P cycle
 - C-N cycle.
 - Deduce the expression for acceptance angle of optical fiber and explain how it can be calculated with the help of fractional refractive index change.



SLR-EP – 14

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**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Make suitable assumptions, *if necessary*.
2) Figures to the **right** indicate **full** marks.
3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants :** 1) Avogadro's no., $N = 6.02 \times 10^{26}$ /k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) Holography means
 - a) To get 2D image of 3D object
 - b) To get zero dimension image
 - c) To get 3D image of 3D object
 - d) To get 3D image of 2D object
- 2) If d is the core diameter of the fiber, then V-number is given by
 - a) $V = \frac{\pi d}{\lambda} \sqrt{n_1^2 - n_2^2}$
 - b) $V = \frac{\pi d}{\lambda} \sqrt{n_2^2 - n_1^2}$
 - c) $V = \frac{2\pi d}{\lambda} \sqrt{n_1^2 - n_2^2}$
 - d) $V = \frac{2\pi d}{\lambda} \sqrt{n_2^2 - n_1^2}$
- 3) The optical fiber has $n_1 = 1.45$ and $n_2 = 1.40$. The critical angle of the fiber is
 - a) $73^\circ 45'$
 - b) $75^\circ 45'$
 - c) $72^\circ 54'$
 - d) $74^\circ 54'$
- 4) Nuclear Fission reaction is
 - a) Combination of two light nuclei, to form heavy and stable nucleus
 - b) Division of heavy nucleus into approximately two equal parts
 - c) Disintegration of nuclei into unstable nucleus
 - d) Thermonuclear reaction

P.T.O.



- 5) Multi Wall Carbon Nanotubes (MWCNT) have diameters ranging from
a) 2 to 25 nm b) 5 to 25 nm
c) 2 to 50 nm d) 20 to 25 nm
- 6) The waves used in Sonography are
a) Microwaves b) Infrared waves
c) Ultraviolet waves d) Ultrasonic waves
- 7) The length of the rod moving with velocity v relative to the observer is same when
a) $v = 0$ b) v is comparable to c
c) $v \geq c$ d) $v \ll c$
- 8) An p-type semiconductor is
a) Positively charged b) Negatively charged
c) Electrically neutral d) None of the above
- 9) Classify the following unit cell into proper crystal system
 $a = 1.08 \text{ nm}$, $b = 0.947 \text{ nm}$, $c = 0.52 \text{ nm}$ with $\alpha = 41^\circ$, $\beta = 82^\circ$ and $\gamma = 95^\circ$.
a) Triclinic b) Orthorhombic
c) Monoclinic d) Hexagonal
- 10) The ultrasonic waves exhibit
a) Large diffraction effect b) Negligible diffraction effect
c) Very long wavelength d) Faster speed than light waves
- 11) The conductivity of a material is
a) $\sigma = \rho.e.\mu$ b) $\mu.\sigma = \rho.e$
c) $\sigma = \rho.e / \rho.\mu$ d) $\sigma = R_{H,\mu}$
- 12) Choose the incorrect statement concerning the theory of relativity
a) Velocity of light is independent of motion
b) It proves the existence of the ether of the observer
c) Time is relative
d) There is variation of mass with velocity
- 13) To find prominent diffraction, the size of the diffraction objects should be
a) greater than the wavelength of light used
b) of the order of wavelength of light
c) less than the wavelength of light
d) none of these
- 14) A calcite crystal is a
a) Uniaxial crystal b) Biaxial crystal
c) Positive crystal d) Opaque crystal
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Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING PHYSICS

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
2) Figures to the **right** indicate **full marks**.

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}$ /k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

SECTION – I

2. Attempt **any five** of the following : 15
- a) Explain Bragg's law.
 - b) Explain the principle of :
 - i) Magnetostriction method
 - ii) Piezo electric method.
 - c) Explain Time dilation.
 - d) The lattice constant for BCC iron at 20°C is 2.85 A.U. The density of an iron is 7870 kg/m³. Calculate its atomic mass.
 - e) Classify the solids into insulator, semiconductor and conductor on the basis of band theory of solids.
 - f) A specimen of aluminum has 6×10^{-5} m thickness. A current of 10 A flows through it and a magnetic field of induction 1.45 T is applied perpendicular to the current direction. Determine the concentration of charge carrier in the material when developed Hall voltage is $10 \mu V$.
 - g) Write properties of ultrasonic waves.

3. Show that in cubic crystal the spacing between consecutive parallel planes of Miller indices (h k l) is given by : 5

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

OR

Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.



4. Attempt **any two** of the following : 8
- a) Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) Define atomic radius. Find the relation between lattice constant and atomic radius for BCC and FCC.
 - c) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - d) Deduce Einstein's expression for mass-energy equivalence.

SECTION – II

5. Attempt **any five** of the following : 15
- a) Distinguish between Fresnel diffraction and Fraunhofer diffraction.
 - b) Calculate the specific rotation if the plane of polarization is turned through $26^\circ 15'$ travelling 20 cm length of 20% sugar solution.
 - c) Define :
 - 1) Stimulated emission
 - 2) Spontaneous emission.
 - d) Explain types of carbon nanotubes depending on chirality.
 - e) Give applications of LASER in different fields.
 - f) The numerical aperture of fiber is 0.25 and relative refractive index is 0.02. Determine the refractive indices of the core and cladding of a fibre.
 - g) Write the advantages of optical fiber over conducting wire.
6. With neat energy transition diagram, explain He-Ne gas laser. 5

OR

Explain the design, working and function of each part of the nuclear fission reactors.

7. Attempt **any two** of the following : 8
- a) With theory, explain plane diffraction grating.
 - b) Describe Laurent's half shade polarimeter for the determination of specific rotation of the substance.
 - c) Explain :
 - i) P-P cycle
 - ii) C-N cycle.
 - d) Deduce the expression for acceptance angle of optical fiber and explain how it can be calculated with the help of fractional refractive index change.



SLR-EP – 15

Seat No.	
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Set

P

**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) **All questions are compulsory.**
 - 2) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Draw neat and labelled diagram wherever necessary.**
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Water containing magnesium bicarbonate and calcium chloride is
 - a) Permanent hard only
 - b) Temporary hard only
 - c) Both temporary and permanent
 - d) None of these
- 2) When graphite is dispersed in oil, it is called
 - a) Grease
 - b) Aquadag
 - c) Oil dag
 - d) Blended oil
- 3) During electrochemical corrosion in acidic environment.
 - a) Oxygen absorption occurs
 - b) Oxygen evolution occurs
 - c) Hydrogen evolution occurs
 - d) Hydrogen absorption occurs
- 4) A semipermeable membrane allows the flow of
 - a) Solvent molecules
 - b) Solute molecules
 - c) Both a) and b)
 - d) None of these
- 5) Oiliness is least in case of
 - a) Mineral oil
 - b) Animal oils
 - c) Greases
 - d) All of these

P.T.O.



- 6) Food stuff containers should not be
- a) Galvanized
 - b) Tinned
 - c) Electroplated
 - d) All of these
- 7) Indigo is
- a) Natural dye
 - b) Artificial dye
 - c) Corrosive chemical
 - d) Lubricant
- 8) The source of kerosene is
- a) Crude petroleum
 - b) Coal
 - c) Wood
 - d) None of these
- 9) The melting point of wrought iron is
- a) 1830°C
 - b) 1530°C
 - c) 2000°C
 - d) 1330°C
- 10) Phenol-Formaldehyde is an example of
- a) Thermoplastic
 - b) Thermo-elastic
 - c) Thermosetting
 - d) Thermite
- 11) Annealing of glass is
- a) Cooling glass articles rapidly
 - b) Passing molten glass between rollers
 - c) Allowing glass articles to cool gradually
 - d) Plunging glass articles suddenly into water
- 12) Which of the following can not be used as carrier gas in GLC ?
- a) Nitrogen
 - b) Argon
 - c) Oxygen
 - d) All of these
- 13) A thermoplastics is formed by the phenomenon of
- a) Chlorination
 - b) Condensation polymerization
 - c) Nitration
 - d) Chain polymerization
- 14) Boy's gas calorimeter is an apparatus used to determine calorific value of
- a) Solid fuel
 - b) Non-volatile liquid fuel
 - c) Volatile liquid fuel
 - d) None of these
-



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat and labelled diagram wherever necessary.**

SECTION – I

2. A) Solve **any two** :

8

- a) Define the terms :
- i) Flash and fire point
 - ii) Viscosity index
 - iii) Cloud and pour point
 - iv) Aniline point.
- b) Explain the traditional and green pathway for synthesis of adipic acid.
- c) A sample of water on analysis was found to contain the following impurities in mg/L.

Impurities	Amount	Molecular Wt.
Ca(HCO ₃) ₂	12	162
Mg (HCO ₃) ₂	10	146
MgSO ₄	08	120
CaCl ₂	09	111

Calculate temporary, permanent and total hardness of water.

B) Solve **any two** :

6

- a) Explain 'semisolid lubricant'.
- b) Explain the mechanism of wet corrosion.
- c) Define aeration. Explain with suitable diagram the mechanism of gravity aerators.



3. A) Solve **any two** : **8**
- a) Explain ion exchange method for softening of hard water.
 - b) How will you prevent the corrosion by proper designing and material selection ?
 - c) Explain : 1) Metal cladding 2) Potentiostat method for prevention of metal from corrosion.

- B) Solve the following : **6**
- a) Define 'Green Chemistry'. State any four principles of green chemistry.
 - b) In an acid value determination experiment 8 gm of an oil sample required 2.9 ml of N/10 KOH solution for neutralization of phenolphthalein end point. Calculate the acid value of the oil sample.

SECTION – II

4. A) Solve **any two** : **8**
- a) Explain the process of manufacturing of glass with suitable reactions.
 - b) Explain construction and working of Boy's gas calorimeter.
 - c) The bomb calorimeter recorded following observations :
Weight of coal burnt = 1.02 gm
Weight of water taken = 750 gm
Water equivalent of bomb and calorimeter = 2200 gm
Rise in temp. = 2.42°C
Cooling correction = 0.045°C
Fuse wire correction = 3 cal
Acid correction = 4.5 cal
Calculate the gross and net calorific value of fuel assuming the latent heat of condensation of steam as 540 cal/gm and H = 8%.

- B) Solve **any two** : **6**
- a) Explain applications of BUNA-S and thiokol rubber.
 - b) Explain properties and applications of epoxy resin.
 - c) Calculate molarity of a solution containing 20 gm of Na_2CO_3 in 2 lit and 10.5 gm of CaCl_2 in 1.5 lit. (mole wt. of Na_2CO_3 = 106, mole wt. of CaCl_2 = 111)



5. A) Solve **any two** : **8**

- a) Explain properties and applications of PVC and PET.
- b) Explain preparation of biodiesel with transesterification process.
State its uses.
- c) Define alloy. Write the purposes of making alloys.

B) Solve the following : **6**

- a) Explain process of vulcanization of natural rubber with suitable reactions.
- b) What are the number average and weight average molecular weight for a polymer having following composition.
100 molecules of molecular wt. 2×10^5 g/mole
300 molecules of molecular wt. 3×10^5 g/mole
400 molecules of molecular wt. 4×10^5 g/mole.

OR

B) Solve the following :

- a) Explain transfer moulding for plastic.
- b) Degree of polymerization of polypropylene is 2×10^4 , calculate the mole wt. of polymer. (molecular wt. of propylene = 42 gm).



SLR-EP – 15

Seat No.	
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Set **Q**

**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
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 - 4) **Draw neat and labelled diagram wherever necessary.**
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The source of kerosene is
 - a) Crude petroleum
 - b) Coal
 - c) Wood
 - d) None of these
- 2) The melting point of wrought iron is
 - a) 1830°C
 - b) 1530°C
 - c) 2000°C
 - d) 1330°C
- 3) Phenol-Formaldehyde is an example of
 - a) Thermoplastic
 - b) Thermo-elastic
 - c) Thermosetting
 - d) Thermite
- 4) Annealing of glass is
 - a) Cooling glass articles rapidly
 - b) Passing molten glass between rollers
 - c) Allowing glass articles to cool gradually
 - d) Plunging glass articles suddenly into water

P.T.O.



- 5) Which of the following can not be used as carrier gas in GLC ?
- Nitrogen
 - Argon
 - Oxygen
 - All of these
- 6) A thermoplastics is formed by the phenomenon of
- Chlorination
 - Condensation polymerization
 - Nitration
 - Chain polymerization
- 7) Boy's gas calorimeter is an apparatus used to determine calorific value of
- Solid fuel
 - Non-volatile liquid fuel
 - Volatile liquid fuel
 - None of these
- 8) Water containing magnesium bicarbonate and calcium chloride is
- Permanent hard only
 - Temporary hard only
 - Both temporary and permanent
 - None of these
- 9) When graphite is dispersed in oil, it is called
- Grease
 - Aquadag
 - Oil dag
 - Blended oil
- 10) During electrochemical corrosion in acidic environment.
- Oxygen absorption occurs
 - Oxygen evolution occurs
 - Hydrogen evolution occurs
 - Hydrogen absorption occurs
- 11) A semipermeable membrane allows the flow of
- Solvent molecules
 - Solute molecules
 - Both a) and b)
 - None of these
- 12) Oiliness is least in case of
- Mineral oil
 - Animal oils
 - Greases
 - All of these
- 13) Food stuff containers should not be
- Galvanized
 - Tinned
 - Electroplated
 - All of these
- 14) Indigo is
- Natural dye
 - Artificial dye
 - Corrosive chemical
 - Lubricant



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
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3) **Draw neat and labelled diagram wherever necessary.**

SECTION – I

2. A) Solve **any two** :

8

- a) Define the terms :
- i) Flash and fire point
 - ii) Viscosity index
 - iii) Cloud and pour point
 - iv) Aniline point.
- b) Explain the traditional and green pathway for synthesis of adipic acid.
- c) A sample of water on analysis was found to contain the following impurities in mg/L.

Impurities	Amount	Molecular Wt.
Ca(HCO ₃) ₂	12	162
Mg (HCO ₃) ₂	10	146
MgSO ₄	08	120
CaCl ₂	09	111

Calculate temporary, permanent and total hardness of water.

B) Solve **any two** :

6

- a) Explain 'semisolid lubricant'.
- b) Explain the mechanism of wet corrosion.
- c) Define aeration. Explain with suitable diagram the mechanism of gravity aerators.



3. A) Solve **any two** : **8**
- a) Explain ion exchange method for softening of hard water.
 - b) How will you prevent the corrosion by proper designing and material selection ?
 - c) Explain : 1) Metal cladding 2) Potentiostat method for prevention of metal from corrosion.

- B) Solve the following : **6**
- a) Define 'Green Chemistry'. State any four principles of green chemistry.
 - b) In an acid value determination experiment 8 gm of an oil sample required 2.9 ml of N/10 KOH solution for neutralization of phenolphthalein end point. Calculate the acid value of the oil sample.

SECTION – II

4. A) Solve **any two** : **8**
- a) Explain the process of manufacturing of glass with suitable reactions.
 - b) Explain construction and working of Boy's gas calorimeter.
 - c) The bomb calorimeter recorded following observations :
Weight of coal burnt = 1.02 gm
Weight of water taken = 750 gm
Water equivalent of bomb and calorimeter = 2200 gm
Rise in temp. = 2.42°C
Cooling correction = 0.045°C
Fuse wire correction = 3 cal
Acid correction = 4.5 cal
Calculate the gross and net calorific value of fuel assuming the latent heat of condensation of steam as 540 cal/gm and H = 8%.

- B) Solve **any two** : **6**
- a) Explain applications of BUNA-S and thiokol rubber.
 - b) Explain properties and applications of epoxy resin.
 - c) Calculate molarity of a solution containing 20 gm of Na_2CO_3 in 2 lit and 10.5 gm of CaCl_2 in 1.5 lit. (mole wt. of $\text{Na}_2\text{CO}_3 = 106$, mole wt. of $\text{CaCl}_2 = 111$)



5. A) Solve **any two** : **8**

- a) Explain properties and applications of PVC and PET.
- b) Explain preparation of biodiesel with transesterification process.
State its uses.
- c) Define alloy. Write the purposes of making alloys.

B) Solve the following : **6**

- a) Explain process of vulcanization of natural rubber with suitable reactions.
- b) What are the number average and weight average molecular weight for a polymer having following composition.
100 molecules of molecular wt. 2×10^5 g/mole
300 molecules of molecular wt. 3×10^5 g/mole
400 molecules of molecular wt. 4×10^5 g/mole.

OR

B) Solve the following :

- a) Explain transfer moulding for plastic.
 - b) Degree of polymerization of polypropylene is 2×10^4 , calculate the mole wt. of polymer. (molecular wt. of propylene = 42 gm).
-



SLR-EP – 15

Seat No.	
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Set **R**

**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Oiliness is least in case of
 - a) Mineral oil
 - b) Animal oils
 - c) Greases
 - d) All of these
- 2) Food stuff containers should not be
 - a) Galvanized
 - b) Tinned
 - c) Electroplated
 - d) All of these
- 3) Indigo is
 - a) Natural dye
 - b) Artificial dye
 - c) Corrosive chemical
 - d) Lubricant
- 4) The source of kerosene is
 - a) Crude petroleum
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 - c) Wood
 - d) None of these
- 5) The melting point of wrought iron is
 - a) 1830°C
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 - d) 1330°C

P.T.O.



- 6) Phenol-Formaldehyde is an example of
- a) Thermoplastic
 - b) Thermo-elastic
 - c) Thermosetting
 - d) Thermit
- 7) Annealing of glass is
- a) Cooling glass articles rapidly
 - b) Passing molten glass between rollers
 - c) Allowing glass articles to cool gradually
 - d) Plunging glass articles suddenly into water
- 8) Which of the following can not be used as carrier gas in GLC ?
- a) Nitrogen
 - b) Argon
 - c) Oxygen
 - d) All of these
- 9) A thermoplastics is formed by the phenomenon of
- a) Chlorination
 - b) Condensation polymerization
 - c) Nitration
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- 10) Boy's gas calorimeter is an apparatus used to determine calorific value of
- a) Solid fuel
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 - b) Aquadag
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- 13) During electrochemical corrosion in acidic environment.
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- 14) A semipermeable membrane allows the flow of
- a) Solvent molecules
 - b) Solute molecules
 - c) Both a) and b)
 - d) None of these
-



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

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SECTION – I

2. A) Solve **any two** :

8

- a) Define the terms :
- i) Flash and fire point
 - ii) Viscosity index
 - iii) Cloud and pour point
 - iv) Aniline point.
- b) Explain the traditional and green pathway for synthesis of adipic acid.
- c) A sample of water on analysis was found to contain the following impurities in mg/L.

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CaCl ₂	09	111

Calculate temporary, permanent and total hardness of water.

B) Solve **any two** :

6

- a) Explain 'semisolid lubricant'.
- b) Explain the mechanism of wet corrosion.
- c) Define aeration. Explain with suitable diagram the mechanism of gravity aerators.



3. A) Solve **any two** : **8**
- a) Explain ion exchange method for softening of hard water.
 - b) How will you prevent the corrosion by proper designing and material selection ?
 - c) Explain : 1) Metal cladding 2) Potentiostat method for prevention of metal from corrosion.

- B) Solve the following : **6**
- a) Define 'Green Chemistry'. State any four principles of green chemistry.
 - b) In an acid value determination experiment 8 gm of an oil sample required 2.9 ml of N/10 KOH solution for neutralization of phenolphthalein end point. Calculate the acid value of the oil sample.

SECTION – II

4. A) Solve **any two** : **8**
- a) Explain the process of manufacturing of glass with suitable reactions.
 - b) Explain construction and working of Boy's gas calorimeter.
 - c) The bomb calorimeter recorded following observations :
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Fuse wire correction = 3 cal
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Calculate the gross and net calorific value of fuel assuming the latent heat of condensation of steam as 540 cal/gm and H = 8%.

- B) Solve **any two** : **6**
- a) Explain applications of BUNA-S and thiokol rubber.
 - b) Explain properties and applications of epoxy resin.
 - c) Calculate molarity of a solution containing 20 gm of Na_2CO_3 in 2 lit and 10.5 gm of CaCl_2 in 1.5 lit. (mole wt. of Na_2CO_3 = 106, mole wt. of CaCl_2 = 111)



5. A) Solve **any two** : **8**

- a) Explain properties and applications of PVC and PET.
- b) Explain preparation of biodiesel with transesterification process.
State its uses.
- c) Define alloy. Write the purposes of making alloys.

B) Solve the following : **6**

- a) Explain process of vulcanization of natural rubber with suitable reactions.
- b) What are the number average and weight average molecular weight for a polymer having following composition.
100 molecules of molecular wt. 2×10^5 g/mole
300 molecules of molecular wt. 3×10^5 g/mole
400 molecules of molecular wt. 4×10^5 g/mole.

OR

B) Solve the following :

- a) Explain transfer moulding for plastic.
- b) Degree of polymerization of polypropylene is 2×10^4 , calculate the mole wt. of polymer. (molecular wt. of propylene = 42 gm).



SLR-EP – 15

Seat No.	
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Set **S**

**F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
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 - 2) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Draw neat and labelled diagram wherever necessary.**
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Phenol-Formaldehyde is an example of
 - a) Thermoplastic
 - b) Thermo-elastic
 - c) Thermosetting
 - d) Thermit
- 2) Annealing of glass is
 - a) Cooling glass articles rapidly
 - b) Passing molten glass between rollers
 - c) Allowing glass articles to cool gradually
 - d) Plunging glass articles suddenly into water
- 3) Which of the following can not be used as carrier gas in GLC ?
 - a) Nitrogen
 - b) Argon
 - c) Oxygen
 - d) All of these
- 4) A thermoplastics is formed by the phenomenon of
 - a) Chlorination
 - b) Condensation polymerization
 - c) Nitration
 - d) Chain polymerization

P.T.O.



- 5) Boy's gas calorimeter is an apparatus used to determine calorific value of
- a) Solid fuel
 - b) Non-volatile liquid fuel
 - c) Volatile liquid fuel
 - d) None of these
- 6) Water containing magnesium bicarbonate and calcium chloride is
- a) Permanent hard only
 - b) Temporary hard only
 - c) Both temporary and permanent
 - d) None of these
- 7) When graphite is dispersed in oil, it is called
- a) Grease
 - b) Aquadag
 - c) Oil dag
 - d) Blended oil
- 8) During electrochemical corrosion in acidic environment.
- a) Oxygen absorption occurs
 - b) Oxygen evolution occurs
 - c) Hydrogen evolution occurs
 - d) Hydrogen absorption occurs
- 9) A semipermeable membrane allows the flow of
- a) Solvent molecules
 - b) Solute molecules
 - c) Both a) and b)
 - d) None of these
- 10) Oiliness is least in case of
- a) Mineral oil
 - b) Animal oils
 - c) Greases
 - d) All of these
- 11) Food stuff containers should not be
- a) Galvanized
 - b) Tinned
 - c) Electroplated
 - d) All of these
- 12) Indigo is
- a) Natural dye
 - b) Artificial dye
 - c) Corrosive chemical
 - d) Lubricant
- 13) The source of kerosene is
- a) Crude petroleum
 - b) Coal
 - c) Wood
 - d) None of these
- 14) The melting point of wrought iron is
- a) 1830°C
 - b) 1530°C
 - c) 2000°C
 - d) 1330°C



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2016
ENGINEERING CHEMISTRY

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat and labelled diagram wherever necessary.**

SECTION – I

2. A) Solve **any two** :

8

- a) Define the terms :
- i) Flash and fire point
 - ii) Viscosity index
 - iii) Cloud and pour point
 - iv) Aniline point.
- b) Explain the traditional and green pathway for synthesis of adipic acid.
- c) A sample of water on analysis was found to contain the following impurities in mg/L.

Impurities	Amount	Molecular Wt.
Ca(HCO ₃) ₂	12	162
Mg (HCO ₃) ₂	10	146
MgSO ₄	08	120
CaCl ₂	09	111

Calculate temporary, permanent and total hardness of water.

B) Solve **any two** :

6

- a) Explain 'semisolid lubricant'.
- b) Explain the mechanism of wet corrosion.
- c) Define aeration. Explain with suitable diagram the mechanism of gravity aerators.



3. A) Solve **any two** : **8**
- Explain ion exchange method for softening of hard water.
 - How will you prevent the corrosion by proper designing and material selection ?
 - Explain : 1) Metal cladding 2) Potentiostat method for prevention of metal from corrosion.

- B) Solve the following : **6**
- Define 'Green Chemistry'. State any four principles of green chemistry.
 - In an acid value determination experiment 8 gm of an oil sample required 2.9 ml of N/10 KOH solution for neutralization of phenolphthalein end point. Calculate the acid value of the oil sample.

SECTION – II

4. A) Solve **any two** : **8**
- Explain the process of manufacturing of glass with suitable reactions.
 - Explain construction and working of Boy's gas calorimeter.
 - The bomb calorimeter recorded following observations :
Weight of coal burnt = 1.02 gm
Weight of water taken = 750 gm
Water equivalent of bomb and calorimeter = 2200 gm
Rise in temp. = 2.42°C
Cooling correction = 0.045°C
Fuse wire correction = 3 cal
Acid correction = 4.5 cal
Calculate the gross and net calorific value of fuel assuming the latent heat of condensation of steam as 540 cal/gm and H = 8%.

- B) Solve **any two** : **6**
- Explain applications of BUNA-S and thiokol rubber.
 - Explain properties and applications of epoxy resin.
 - Calculate molarity of a solution containing 20 gm of Na_2CO_3 in 2 lit and 10.5 gm of CaCl_2 in 1.5 lit. (mole wt. of $\text{Na}_2\text{CO}_3 = 106$, mole wt. of $\text{CaCl}_2 = 111$)



5. A) Solve **any two** : **8**

- a) Explain properties and applications of PVC and PET.
- b) Explain preparation of biodiesel with transesterification process.
State its uses.
- c) Define alloy. Write the purposes of making alloys.

B) Solve the following : **6**

- a) Explain process of vulcanization of natural rubber with suitable reactions.
- b) What are the number average and weight average molecular weight for a polymer having following composition.
100 molecules of molecular wt. 2×10^5 g/mole
300 molecules of molecular wt. 3×10^5 g/mole
400 molecules of molecular wt. 4×10^5 g/mole.

OR

B) Solve the following :

- a) Explain transfer moulding for plastic.
- b) Degree of polymerization of polypropylene is 2×10^4 , calculate the mole wt. of polymer. (molecular wt. of propylene = 42 gm).



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Set	P
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions:** 1) Make suitable assumptions, if necessary.
2) Figures to the **right** indicate **full** marks.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants:** 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. 1) N-type semiconductor is formed by adding impurity elements of valency **14**
a) 3 b) 4 c) 5 d) 6
- 2) The band gap energy of Ge is approximately
a) 0.3 eV b) 0.7 eV c) 1.1 eV d) 3.8 eV
- 3) The relation of angle between axes for a tetragonal crystal system is
a) $\alpha = \beta = \gamma = 90^\circ$ b) $\alpha \neq \beta \neq \gamma \neq 90^\circ$
c) $\alpha = 120^\circ, \beta = \gamma = 90^\circ$ d) $\alpha = 90^\circ, \beta = \gamma = 120^\circ$
- 4) Total axes of symmetry for cubic structure is
a) 3 b) 6 c) 9 d) 13
- 5) The rod used in magnetostriction method for the production of ultrasonic waves is made up of
a) Nickel b) Copper c) Aluminium d) Nichrome

P.T.O.



- 6) Einstein's mass energy relation ($E = mc^2$) shows that
- Mass disappears to reappear as energy
 - Energy disappears to reappear as mass
 - Mass and energy are two different forms of the same entity
 - All the above statements are correct
- 7) The persistence of audible sound after the source has stopped to emit sound is known as
- Echo
 - Reverberation
 - Reflection
 - Magnetostriction effect

SECTION – II

- 8) The resolving power of a grating is
- $\lambda / d\lambda$
 - $nNd\lambda$
 - $d\lambda / \lambda$
 - $n(n + 1)$
- 9) In a plane transmission grating, the condition for secondary maxima is
- $(a + b) \sin \theta = n\lambda$
 - $(a + b) \sin \theta = (2n - 1) \cdot \lambda / 2$
 - $(a + b) \sin \theta = (2n + 1) \cdot \lambda / 2$
 - $(a - b) \sin \theta = (2n - 1) \cdot \lambda / 2$
- 10) The stimulated absorption process is mathematically represented as
- $A + h\gamma \rightarrow A^*$
 - $A^* + h\gamma \rightarrow 2h\gamma + A$
 - $A^* \rightarrow A + h\gamma$
 - $A^* + h\gamma \rightarrow A + h\gamma$
- 11) The wavelength of emission from He-Ne laser is
- $10.64 \mu\text{m}$
 - 337.1 nm
 - 694.3 nm
 - 632.8 nm
- 12) The end at which light enters the fiber is known as
- Acceptance cone
 - Acceptance angle
 - Incident corner
 - Launching end
- 13) Chirality of Armchair CNT is
- $(a, 0)$
 - (a, a)
 - (a, b)
 - $(0, b)$
- 14) In nuclear reactor, moderator is used
- To increase velocity of neutron
 - To slow down the fast neutrons
 - To absorb the neutron
 - To transfer the energy from core to heat exchanger



Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Make suitable assumptions, if **necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : 15
- a) Explain effect of impurity concentration on the position of Fermi level in N and P type semiconductors.
 - b) Determine the number of atoms per unit cell and atomic radius of FCC lattice.
 - c) Explain any three applications of ultrasonic waves.
 - d) Deduce an expression for length contraction.
 - e) Explain Bragg's Law.
 - f) The mean life π meson is 2×10^{-08} sec. Calculate the mean life of a meson moving with a velocity of 0.8 c.
 - g) The R_H of a specimen is $3.66 \times 10^{-4} \text{ m}^3/\text{C}$. Its resistivity is $8.93 \times 10^{-3} \Omega \text{ m}$. Find the mobility and density of charge carriers.
3. Define Miller indices of a crystal plane. Show that in a cubic crystal the spacing between consecutive parallel planes of miller indices (hkl) is given by $b = a/\sqrt{(h^2 + k^2 + l^2)}$. 5
4. Attempt **any two** of the following : 8
- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - c) Deduce the expression for relativistic mass variation, to show $m = m_0/(1 - v^2/c^2)^{1/2}$.

Set P



SECTION – II

5. Attempt **any five** of the following : 15
- a) Explain : (i) Stimulated Emission (ii) Population Inversion.
 - b) Write note on double refraction phenomenon.
 - c) Write applications of LASER in different fields.
 - d) Explain types of carbon nanotubes (CNT) on the basis of chirality.
 - e) Explain with neat diagram principle of optical fibre.
 - f) Determine acceptance angle, numerical aperture and critical angle of the optical fibre having refractive index of core 1.48 and that of cladding is 1.44.
 - g) Find the angle of second order diffraction for the source of light having wavelength 5000 A.U. The number of lines/cm on the grating surface is 6000.
6. Explain the essential features for the design and working of a nuclear fission reactor. 5

OR

Explain theory of diffraction grating in short. Derive an expression for the resolving power of a plane diffraction grating.

7. Attempt **any two** of the following : 8
- a) What do you mean by thermonuclear reaction ? Also explain Proton-Proton and Carbon-Nitrogen cycle.
 - b) Write applications of fibre optics in different fields.
 - c) Write note on holography.
-



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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) Make suitable assumptions, if necessary.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
 - 2) Velocity of light, $c = 3 \times 10^8$ m/sec.
 - 3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. 1) The relation of angle between axes for a tetragonal crystal system is **14**
- | | |
|--|--|
| a) $\alpha = \beta = \gamma = 90^\circ$ | b) $\alpha \neq \beta \neq \gamma \neq 90^\circ$ |
| c) $\alpha = 120^\circ, \beta = \gamma = 90^\circ$ | d) $\alpha = 90^\circ, \beta = \gamma = 120^\circ$ |
- 2) Total axes of symmetry for cubic structure is
- | | | | |
|------|------|------|-------|
| a) 3 | b) 6 | c) 9 | d) 13 |
|------|------|------|-------|
- 3) The rod used in magnetostriction method for the production of ultrasonic waves is made up of
- | | | | |
|-----------|-----------|--------------|-------------|
| a) Nickel | b) Copper | c) Aluminium | d) Nichrome |
|-----------|-----------|--------------|-------------|
- 4) Einstein's mass energy relation ($E = mc^2$) shows that
- a) Mass disappears to reappear as energy
 - b) Energy disappears to reappear as mass
 - c) Mass and energy are two different forms of the same entity
 - d) All the above statements are correct

P.T.O.



- 5) The persistence of audible sound after the source has stopped to emit sound is known as
a) Echo
b) Reverberation
c) Reflection
d) Magnetostriction effect
- 6) N-type semiconductor is formed by adding impurity elements of valency
a) 3
b) 4
c) 5
d) 6
- 7) The band gap energy of Ge is approximately
a) 0.3 eV
b) 0.7 eV
c) 1.1 eV
d) 3.8 eV

SECTION – II

- 8) The stimulated absorption process is mathematically represented as
a) $A + h\gamma \rightarrow A^*$
b) $A^* + h\gamma \rightarrow 2h\gamma + A$
c) $A^* \rightarrow A + h\gamma$
d) $A^* + h\gamma \rightarrow A + h\gamma$
- 9) The wavelength of emission from He-Ne laser is
a) $10.64 \mu\text{m}$
b) 337.1 nm
c) 694.3 nm
d) 632.8 nm
- 10) The end at which light enters the fiber is known as
a) Acceptance cone
b) Acceptance angle
c) Incident corner
d) Launching end
- 11) Chirality of Armchair CNT is
a) $(a, 0)$
b) (a, a)
c) (a, b)
d) $(0, b)$
- 12) In nuclear reactor, moderator is used
a) To increase velocity of neutron
b) To slow down the fast neutrons
c) To absorb the neutron
d) To transfer the energy from core to heat exchanger
- 13) The resolving power of a grating is
a) $\lambda / d\lambda$
b) $nNd\lambda$
c) $d\lambda / \lambda$
d) $n(n + 1)$
- 14) In a plane transmission grating, the condition for secondary maxima is
a) $(a + b) \sin \theta = n\lambda$
b) $(a + b) \sin \theta = (2n - 1) \cdot \lambda / 2$
c) $(a + b) \sin \theta = (2n + 1) \cdot \lambda / 2$
d) $(a - b) \sin \theta = (2n - 1) \cdot 2 \cdot \lambda / 2$



Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Make suitable assumptions, if **necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : 15
- a) Explain effect of impurity concentration on the position of Fermi level in N and P type semiconductors.
 - b) Determine the number of atoms per unit cell and atomic radius of FCC lattice.
 - c) Explain any three applications of ultrasonic waves.
 - d) Deduce an expression for length contraction.
 - e) Explain Bragg's Law.
 - f) The mean life π meson is 2×10^{-08} sec. Calculate the mean life of a meson moving with a velocity of 0.8 c.
 - g) The R_H of a specimen is $3.66 \times 10^{-4} \text{ m}^3/\text{C}$. Its resistivity is $8.93 \times 10^{-3} \Omega \text{ m}$. Find the mobility and density of charge carriers.
3. Define Miller indices of a crystal plane. Show that in a cubic crystal the spacing between consecutive parallel planes of miller indices (hkl) is given by $b = a/\sqrt{(h^2 + k^2 + l^2)}$. 5
4. Attempt **any two** of the following : 8
- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - c) Deduce the expression for relativistic mass variation, to show $m = m_0/(1 - v^2/c^2)^{1/2}$.

Set Q



SECTION – II

5. Attempt **any five** of the following : 15
- Explain : (i) Stimulated Emission (ii) Population Inversion.
 - Write note on double refraction phenomenon.
 - Write applications of LASER in different fields.
 - Explain types of carbon nanotubes (CNT) on the basis of chirality.
 - Explain with neat diagram principle of optical fibre.
 - Determine acceptance angle, numerical aperture and critical angle of the optical fibre having refractive index of core 1.48 and that of cladding is 1.44.
 - Find the angle of second order diffraction for the source of light having wavelength 5000 A.U. The number of lines/cm on the grating surface is 6000.

6. Explain the essential features for the design and working of a nuclear fission reactor. 5

OR

Explain theory of diffraction grating in short. Derive an expression for the resolving power of a plane diffraction grating.

7. Attempt **any two** of the following : 8
- What do you mean by thermonuclear reaction ? Also explain Proton-Proton and Carbon-Nitrogen cycle.
 - Write applications of fibre optics in different fields.
 - Write note on holography.
-



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Seat No.	
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Set	R
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :**
- 1) Make suitable assumptions, if necessary.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
 - 2) Velocity of light, $c = 3 \times 10^8$ m/sec.
 - 3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

- 1) The rod used in magnetostriction method for the production of ultrasonic waves is made up of **14**
 - a) Nickel
 - b) Copper
 - c) Aluminium
 - d) Nichrome
- 2) Einstein's mass energy relation ($E = mc^2$) shows that
 - a) Mass disappears to reappear as energy
 - b) Energy disappears to reappear as mass
 - c) Mass and energy are two different forms of the same entity
 - d) All the above statements are correct
- 3) The persistence of audible sound after the source has stopped to emit sound is known as
 - a) Echo
 - b) Reverberation
 - c) Reflection
 - d) Magnetostriction effect
- 4) N-type semiconductor is formed by adding impurity elements of valency
 - a) 3
 - b) 4
 - c) 5
 - d) 6

P.T.O.



- 5) The band gap energy of Ge is approximately
 a) 0.3 eV b) 0.7 eV c) 1.1 eV d) 3.8 eV
- 6) The relation of angle between axes for a tetragonal crystal system is
 a) $\alpha = \beta = \gamma = 90^\circ$ b) $\alpha \neq \beta \neq \gamma \neq 90^\circ$
 c) $\alpha = 120^\circ, \beta = \gamma = 90^\circ$ d) $\alpha = 90^\circ, \beta = \gamma = 120^\circ$
- 7) Total axes of symmetry for cubic structure is
 a) 3 b) 6 c) 9 d) 13

SECTION – II

- 8) The end at which light enters the fiber is known as
 a) Acceptance cone b) Acceptance angle
 c) Incident corner d) Launching end
- 9) Chirality of Armchair CNT is
 a) (a, 0) b) (a, a) c) (a, b) d) (0, b)
- 10) In nuclear reactor, moderator is used
 a) To increase velocity of neutron
 b) To slow down the fast neutrons
 c) To absorb the neutron
 d) To transfer the energy from core to heat exchanger
- 11) The resolving power of a grating is
 a) $\lambda / d\lambda$ b) $nNd\lambda$ c) $d\lambda / \lambda$ d) $n(n + 1)$
- 12) In a plane transmission grating, the condition for secondary maxima is
 a) $(a + b) \sin \theta = n\lambda$ b) $(a + b) \sin \theta = (2n - 1) \cdot \lambda / 2$
 c) $(a + b) \sin \theta = (2n + 1) \cdot \lambda / 2$ d) $(a - b) \sin \theta = (2n - 1) \cdot \lambda / 2$
- 13) The stimulated absorption process is mathematically represented as
 a) $A + h\nu \rightarrow A^*$ b) $A^* + h\nu \rightarrow 2h\nu + A$
 c) $A^* \rightarrow A + h\nu$ d) $A^* + h\nu \rightarrow A + h\nu$
- 14) The wavelength of emission from He-Ne laser is
 a) 10.64 μm b) 337.1 nm c) 694.3 nm d) 632.8 nm



Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Make suitable assumptions, if **necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : 15
- a) Explain effect of impurity concentration on the position of Fermi level in N and P type semiconductors.
 - b) Determine the number of atoms per unit cell and atomic radius of FCC lattice.
 - c) Explain any three applications of ultrasonic waves.
 - d) Deduce an expression for length contraction.
 - e) Explain Bragg's Law.
 - f) The mean life π meson is 2×10^{-08} sec. Calculate the mean life of a meson moving with a velocity of 0.8 c.
 - g) The R_H of a specimen is $3.66 \times 10^{-4} \text{ m}^3/\text{C}$. Its resistivity is $8.93 \times 10^{-3} \Omega \text{ m}$. Find the mobility and density of charge carriers.
3. Define Miller indices of a crystal plane. Show that in a cubic crystal the spacing between consecutive parallel planes of miller indices (hkl) is given by $b = a/\sqrt{(h^2 + k^2 + l^2)}$. 5
4. Attempt **any two** of the following : 8
- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - c) Deduce the expression for relativistic mass variation, to show $m = m_0/(1 - v^2/c^2)^{1/2}$.

Set R



SECTION – II

5. Attempt **any five** of the following : 15
- Explain : (i) Stimulated Emission (ii) Population Inversion.
 - Write note on double refraction phenomenon.
 - Write applications of LASER in different fields.
 - Explain types of carbon nanotubes (CNT) on the basis of chirality.
 - Explain with neat diagram principle of optical fibre.
 - Determine acceptance angle, numerical aperture and critical angle of the optical fibre having refractive index of core 1.48 and that of cladding is 1.44.
 - Find the angle of second order diffraction for the source of light having wavelength 5000 A.U. The number of lines/cm on the grating surface is 6000.

6. Explain the essential features for the design and working of a nuclear fission reactor. 5

OR

Explain theory of diffraction grating in short. Derive an expression for the resolving power of a plane diffraction grating.

7. Attempt **any two** of the following : 8
- What do you mean by thermonuclear reaction ? Also explain Proton-Proton and Carbon-Nitrogen cycle.
 - Write applications of fibre optics in different fields.
 - Write note on holography.
-



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Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Make suitable assumptions, if necessary.
2) Figures to the **right** indicate **full** marks.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

- Constants :** 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. 1) The persistence of audible sound after the source has stopped to emit sound is known as **14**
a) Echo b) Reverberation
c) Reflection d) Magnetostriction effect
- 2) N-type semiconductor is formed by adding impurity elements of valency
a) 3 b) 4 c) 5 d) 6
- 3) The band gap energy of Ge is approximately
a) 0.3 eV b) 0.7 eV c) 1.1 eV d) 3.8 eV
- 4) The relation of angle between axes for a tetragonal crystal system is
a) $\alpha = \beta = \gamma = 90^\circ$ b) $\alpha \neq \beta \neq \gamma \neq 90^\circ$
c) $\alpha = 120^\circ, \beta = \gamma = 90^\circ$ d) $\alpha = 90^\circ, \beta = \gamma = 120^\circ$
- 5) Total axes of symmetry for cubic structure is
a) 3 b) 6 c) 9 d) 13

P.T.O.



- 6) The rod used in magnetostriction method for the production of ultrasonic waves is made up of
a) Nickel b) Copper c) Aluminium d) Nichrome
- 7) Einstein's mass energy relation ($E = mc^2$) shows that
a) Mass disappears to reappear as energy
b) Energy disappears to reappear as mass
c) Mass and energy are two different forms of the same entity
d) All the above statements are correct

SECTION – II

- 8) In nuclear reactor, moderator is used
a) To increase velocity of neutron
b) To slow down the fast neutrons
c) To absorb the neutron
d) To transfer the energy from core to heat exchanger
- 9) The resolving power of a grating is
a) $\lambda / d\lambda$ b) $nNd\lambda$ c) $d\lambda / \lambda$ d) $n(n + 1)$
- 10) In a plane transmission grating, the condition for secondary maxima is
a) $(a + b) \sin \theta = n\lambda$ b) $(a + b) \sin \theta = (2n - 1) \cdot \lambda / 2$
c) $(a + b) \sin \theta = (2n + 1) \cdot \lambda / 2$ d) $(a - b) \sin \theta = (2n - 1) \cdot \lambda / 2$
- 11) The stimulated absorption process is mathematically represented as
a) $A + h\gamma \rightarrow A^*$ b) $A^* + h\gamma \rightarrow 2h\gamma + A$
c) $A^* \rightarrow A + h\gamma$ d) $A^* + h\gamma \rightarrow A + h\gamma$
- 12) The wavelength of emission from He-Ne laser is
a) $10.64 \mu\text{m}$ b) 337.1 nm c) 694.3 nm d) 632.8 nm
- 13) The end at which light enters the fiber is known as
a) Acceptance cone b) Acceptance angle
c) Incident corner d) Launching end
- 14) Chirality of Armchair CNT is
a) $(a, 0)$ b) (a, a) c) (a, b) d) $(0, b)$



Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING PHYSICS**

Day and Date : Wednesday, 21-12-2016

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Make suitable assumptions, if **necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : 15
- a) Explain effect of impurity concentration on the position of Fermi level in N and P type semiconductors.
 - b) Determine the number of atoms per unit cell and atomic radius of FCC lattice.
 - c) Explain any three applications of ultrasonic waves.
 - d) Deduce an expression for length contraction.
 - e) Explain Bragg's Law.
 - f) The mean life π meson is 2×10^{-08} sec. Calculate the mean life of a meson moving with a velocity of 0.8 c.
 - g) The R_H of a specimen is $3.66 \times 10^{-4} \text{ m}^3/\text{C}$. Its resistivity is $8.93 \times 10^{-3} \Omega \text{ m}$. Find the mobility and density of charge carriers.
3. Define Miller indices of a crystal plane. Show that in a cubic crystal the spacing between consecutive parallel planes of miller indices (hkl) is given by $b = a/\sqrt{(h^2 + k^2 + l^2)}$. 5
4. Attempt **any two** of the following : 8
- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
 - c) Deduce the expression for relativistic mass variation, to show $m = m_0/(1 - v^2/c^2)^{1/2}$.

Set S



SECTION – II

5. Attempt **any five** of the following : **15**
- a) Explain : (i) Stimulated Emission (ii) Population Inversion.
 - b) Write note on double refraction phenomenon.
 - c) Write applications of LASER in different fields.
 - d) Explain types of carbon nanotubes (CNT) on the basis of chirality.
 - e) Explain with neat diagram principle of optical fibre.
 - f) Determine acceptance angle, numerical aperture and critical angle of the optical fibre having refractive index of core 1.48 and that of cladding is 1.44.
 - g) Find the angle of second order diffraction for the source of light having wavelength 5000 A.U. The number of lines/cm on the grating surface is 6000.
6. Explain the essential features for the design and working of a nuclear fission reactor. **5**

OR

Explain theory of diffraction grating in short. Derive an expression for the resolving power of a plane diffraction grating.

7. Attempt **any two** of the following : **8**
- a) What do you mean by thermonuclear reaction ? Also explain Proton-Proton and Carbon-Nitrogen cycle.
 - b) Write applications of fibre optics in different fields.
 - c) Write note on holography.
-



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P

**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only.**
Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Aerobic oxidation is caused by
 - A) Aerobic bacterias in presence of excess of O₂
 - B) Anaerobic bacterias in presence of insufficient O₂
 - C) Aerobic bacterias in absence of O₂
 - D) None of these
- 2) A semipermeable membrane allow the flow of
 - A) Solvent molecules
 - B) Solute molecules
 - C) Both A and B
 - D) None of these
- 3) A system consists of water in contact with its vapour, the degree of freedom is
 - A) Zero
 - B) One
 - C) Two
 - D) Three
- 4) Machine operating at high temperatures and high loads are best lubricated by
 - A) Mineral oils
 - B) Solid Lubricants
 - C) Greases
 - D) Animal oils
- 5) In Ag-Pb system, at the Eutectic Point, the number of phases at equilibrium are
 - A) One
 - B) Two
 - C) Three
 - D) Zero
- 6) Corrosion is an example of
 - A) Oxidation
 - B) Reduction
 - C) Electrolysis
 - D) Erosion
- 7) Drying oils supply to paint film
 - A) Water Proofness
 - B) Medium or Vehicle
 - C) Main film forming constituent
 - D) All of these

P.T.O.



- 8) Analysis of sulphur in coal is carried out by
A) Proximate analysis B) Ultimate analysis
C) Volumetric analysis D) None of these
- 9) The purest commercial form of iron is
A) Cast iron B) Steel C) Wrought iron D) Stainless steel
- 10) An alloy having high electrical resistance and can be used in heating appliances is
A) Duralumin B) Brass C) Stainless steel D) Nichrome
- 11) An organic polymer shows appreciable conductivity if polymer chain contains
A) Conjugation B) Only single bond
C) Only double bond D) Functional group
- 12) The most widely used vulcanizing agent is
A) Ozone B) Sulphur C) Chlorine D) Phosphorous
- 13) What is the normality of 1 litre solution containing 40 gm of NaOH ?
A) 1 N B) 4 N C) 2 N D) 0.1 N
- 14) The detection of steroid drugs used by athletes can be carried out by
A) TGA B) DTA C) DSC D) GLC
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Seat No.	
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F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** i) Attempt **all** questions.
ii) Draw **neat** diagrams **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : 8

a) A sample of water on analysis has been found to contain the following impurities in ppm as

Impurities	Amount	Mole. Wt.
Ca(HCO ₃) ₂	8.50	162
Mg(HCO ₃) ₂	10.30	146
CaCl ₂	4.93	111
Mg SO ₄	2.50	120

Calculate temporary, permanent and total hardness of water.

- b) Define aeration. Explain surface and gravity aerators with suitable diagram.
c) Draw and explain the important features of phase diagram of one component water system.

B) Attempt **any two** : 6

- a) Define lubrication. Explain fluid film lubrication in detail.
b) Give an account of cathodic protection of corrosion by sacrificial anodic method.
c) Select the lubricant for :
i) Cutting tools
ii) Transformers
iii) Internal combustion engine.

3. A) Attempt **any two** : 6

- a) Explain scales and sludge formation in boilers with its prevention measures.
b) Write a note on Galvanizing.
c) Define with examples :
i) Reduced phase rule
ii) Component
iii) Degree of freedom.

Set P



- B) Attempt **any two** : 8
- a) Write a note on co-agulation of H_2O .
 - b) Discuss the following as a lubricants :
 - i) Animal and vegetable oils
 - ii) Mineral oils.
 - c) Discuss the mechanism of wet corrosion by :
 - i) Hydrogen evolution method
 - ii) Oxygen absorption method.

SECTION – II

4. A) Attempt **any two** : 8
- a) Explain steps of setting and hardening of portland cement with chemical reactions.
 - b) Calculate HCV and LCV of a coal sample having the following composition
C = 75%, O = 5%, H = 6%, S = 0.8%, N = 3%, ash = 10.2%
Take latent heat of steam = 540 Kcal/Kg
 - c) Explain isolation of natural rubber from latex.
- B) Attempt **any two** : 6
- a) Draw a labelled block diagram of GLC.
 - b) Distinguish between addition and condensation polymerization.
 - c) Define
 - i) Calorific value
 - ii) Polymerization
 - iii) TGA.
5. A) i) Write compound constituents of portland cement. 3
- ii) What are advantages and disadvantages of gaseous fuel or solid fuel ? 3

OR

- A) i) What is the weight of $MgSO_4$ required to prepare 0.5 N solution of 750 ml ?
(Mole. Wt. of $MgSO_4 = 120$) 3
- ii) Write a note on polymers in medicine and surgery. 3
- B) Attempt **any two** : 8
- i) Explain construction and working of bomb calorimeter. 4
 - ii) Explain composition, properties and applications of different varieties of steel. 4
 - iii) a) Calculate the molecular weight of polymer having D.P. = 4500, where molecular weight of monomer is 56. 2
 - b) Give properties and uses of two types of glass. 2



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Set

Q

**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only.**
Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Analysis of sulphur in coal is carried out by
 - A) Proximate analysis
 - B) Ultimate analysis
 - C) Volumetric analysis
 - D) None of these
- 2) The purest commercial form of iron is
 - A) Cast iron
 - B) Steel
 - C) Wrought iron
 - D) Stainless steel
- 3) An alloy having high electrical resistance and can be used in heating appliances is
 - A) Duralumin
 - B) Brass
 - C) Stainless steel
 - D) Nichrome
- 4) An organic polymer shows appreciable conductivity if polymer chain contains
 - A) Conjugation
 - B) Only single bond
 - C) Only double bond
 - D) Functional group
- 5) The most widely used vulcanizing agent is
 - A) Ozone
 - B) Sulphur
 - C) Chlorine
 - D) Phosphorous
- 6) What is the normality of 1 litre solution containing 40 gm of NaOH ?
 - A) 1 N
 - B) 4 N
 - C) 2 N
 - D) 0.1 N
- 7) The detection of steroid drugs used by athletes can be carried out by
 - A) TGA
 - B) DTA
 - C) DSC
 - D) GLC
- 8) Aerobic oxidation is caused by
 - A) Aerobic bacterias in presence of excess of O₂
 - B) Anaerobic bacterias in presence of insufficient O₂
 - C) Aerobic bacterias in absence of O₂
 - D) None of these

P.T.O.



- 9) A semipermeable membrane allow the flow of
A) Solvent molecules B) Solute molecules
C) Both A and B D) None of these
- 10) A system consists of water in contact with its vapour, the degree of freedom is
A) Zero B) One C) Two D) Three
- 11) Machine operating at high temperatures and high loads are best lubricated by
A) Mineral oils B) Solid Lubricants
C) Greases D) Animal oils
- 12) In Ag-Pb system, at the Eutectic Point, the number of phases at equilibrium are
A) One B) Two C) Three D) Zero
- 13) Corrosion is an example of
A) Oxidation B) Reduction C) Electrolysis D) Erosion
- 14) Drying oils supply to paint film
A) Water Proofness B) Medium or Vehicle
C) Main film forming constituent D) All of these
-



Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** i) Attempt **all** questions.
ii) Draw **neat** diagrams **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : **8**
- a) A sample of water on analysis has been found to contain the following impurities in ppm as
- | Impurities | Amount | Mole. Wt. |
|------------------------------------|--------|-----------|
| Ca(HCO ₃) ₂ | 8.50 | 162 |
| Mg(HCO ₃) ₂ | 10.30 | 146 |
| CaCl ₂ | 4.93 | 111 |
| Mg SO ₄ | 2.50 | 120 |
- Calculate temporary, permanent and total hardness of water.
- b) Define aeration. Explain surface and gravity aerators with suitable diagram.
- c) Draw and explain the important features of phase diagram of one component water system.
- B) Attempt **any two** : **6**
- a) Define lubrication. Explain fluid film lubrication in detail.
- b) Give an account of cathodic protection of corrosion by sacrificial anodic method.
- c) Select the lubricant for :
- i) Cutting tools
 - ii) Transformers
 - iii) Internal combustion engine.
3. A) Attempt **any two** : **6**
- a) Explain scales and sludge formation in boilers with its prevention measures.
- b) Write a note on Galvanizing.
- c) Define with examples :
- i) Reduced phase rule
 - ii) Component
 - iii) Degree of freedom.

Set Q



- B) Attempt **any two** : 8
- a) Write a note on co-agulation of H_2O .
 - b) Discuss the following as a lubricants :
 - i) Animal and vegetable oils
 - ii) Mineral oils.
 - c) Discuss the mechanism of wet corrosion by :
 - i) Hydrogen evolution method
 - ii) Oxygen absorption method.

SECTION – II

4. A) Attempt **any two** : 8
- a) Explain steps of setting and hardening of portland cement with chemical reactions.
 - b) Calculate HCV and LCV of a coal sample having the following composition
C = 75%, O = 5%, H = 6%, S = 0.8%, N = 3%, ash = 10.2%
Take latent heat of steam = 540 Kcal/Kg
 - c) Explain isolation of natural rubber from latex.
- B) Attempt **any two** : 6
- a) Draw a labelled block diagram of GLC.
 - b) Distinguish between addition and condensation polymerization.
 - c) Define
 - i) Calorific value
 - ii) Polymerization
 - iii) TGA.
5. A) i) Write compound constituents of portland cement. 3
 ii) What are advantages and disadvantages of gaseous fuel or solid fuel ? 3

OR

- A) i) What is the weight of $MgSO_4$ required to prepare 0.5 N solution of 750 ml ?
(Mole. Wt. of $MgSO_4 = 120$) 3
 ii) Write a note on polymers in medicine and surgery. 3
- B) Attempt **any two** : 8
- i) Explain construction and working of bomb calorimeter. 4
 - ii) Explain composition, properties and applications of different varieties of steel. 4
 - iii) a) Calculate the molecular weight of polymer having D.P. = 4500, where molecular weight of monomer is 56. 2
 b) Give properties and uses of two types of glass. 2



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Seat No.	
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Set

R

**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

N.B. : 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only.**
Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**

- 1) In Ag-Pb system, at the Eutectic Point, the number of phases at equilibrium are
A) One B) Two C) Three D) Zero
- 2) Corrosion is an example of
A) Oxidation B) Reduction C) Electrolysis D) Erosion
- 3) Drying oils supply to paint film
A) Water Proofness B) Medium or Vehicle
C) Main film forming constituent D) All of these
- 4) Analysis of sulphur in coal is carried out by
A) Proximate analysis B) Ultimate analysis
C) Volumetric analysis D) None of these
- 5) The purest commercial form of iron is
A) Cast iron B) Steel C) Wrought iron D) Stainless steel
- 6) An alloy having high electrical resistance and can be used in heating appliances is
A) Duralumin B) Brass C) Stainless steel D) Nichrome
- 7) An organic polymer shows appreciable conductivity if polymer chain contains
A) Conjugation B) Only single bond
C) Only double bond D) Functional group
- 8) The most widely used vulcanizing agent is
A) Ozone B) Sulphur C) Chlorine D) Phosphorous

P.T.O.



- 9) What is the normality of 1 litre solution containing 40 gm of NaOH ?
A) 1 N B) 4 N C) 2 N D) 0.1 N
- 10) The detection of steroid drugs used by athletes can be carried out by
A) TGA B) DTA C) DSC D) GLC
- 11) Aerobic oxidation is caused by
A) Aerobic bacterias in presence of excess of O₂
B) Anaerobic bacterias in presence of insufficient O₂
C) Aerobic bacterias in absence of O₂
D) None of these
- 12) A semipermeable membrane allow the flow of
A) Solvent molecules B) Solute molecules
C) Both A and B D) None of these
- 13) A system consists of water in contact with its vapour, the degree of freedom is
A) Zero B) One C) Two D) Three
- 14) Machine operating at high temperatures and high loads are best lubricated by
A) Mineral oils B) Solid Lubricants
C) Greases D) Animal oils
-



Seat No.	
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F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** i) Attempt **all** questions.
ii) Draw **neat** diagrams **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : 8

a) A sample of water on analysis has been found to contain the following impurities in ppm as

Impurities	Amount	Mole. Wt.
Ca(HCO ₃) ₂	8.50	162
Mg(HCO ₃) ₂	10.30	146
CaCl ₂	4.93	111
Mg SO ₄	2.50	120

Calculate temporary, permanent and total hardness of water.

- b) Define aeration. Explain surface and gravity aerators with suitable diagram.
c) Draw and explain the important features of phase diagram of one component water system.

B) Attempt **any two** : 6

- a) Define lubrication. Explain fluid film lubrication in detail.
b) Give an account of cathodic protection of corrosion by sacrificial anodic method.
c) Select the lubricant for :
i) Cutting tools
ii) Transformers
iii) Internal combustion engine.

3. A) Attempt **any two** : 6

- a) Explain scales and sludge formation in boilers with its prevention measures.
b) Write a note on Galvanizing.
c) Define with examples :
i) Reduced phase rule
ii) Component
iii) Degree of freedom.

Set R



- B) Attempt **any two** : 8
- a) Write a note on co-agulation of H_2O .
 - b) Discuss the following as a lubricants :
 - i) Animal and vegetable oils
 - ii) Mineral oils.
 - c) Discuss the mechanism of wet corrosion by :
 - i) Hydrogen evolution method
 - ii) Oxygen absorption method.

SECTION – II

4. A) Attempt **any two** : 8
- a) Explain steps of setting and hardening of portland cement with chemical reactions.
 - b) Calculate HCV and LCV of a coal sample having the following composition
C = 75%, O = 5%, H = 6%, S = 0.8%, N = 3%, ash = 10.2%
Take latent heat of steam = 540 Kcal/Kg
 - c) Explain isolation of natural rubber from latex.
- B) Attempt **any two** : 6
- a) Draw a labelled block diagram of GLC.
 - b) Distinguish between addition and condensation polymerization.
 - c) Define
 - i) Calorific value
 - ii) Polymerization
 - iii) TGA.
5. A) i) Write compound constituents of portland cement. 3
 ii) What are advantages and disadvantages of gaseous fuel or solid fuel ? 3

OR

- A) i) What is the weight of $MgSO_4$ required to prepare 0.5 N solution of 750 ml ?
(Mole. Wt. of $MgSO_4 = 120$) 3
 ii) Write a note on polymers in medicine and surgery. 3
- B) Attempt **any two** : 8
- i) Explain construction and working of bomb calorimeter. 4
 - ii) Explain composition, properties and applications of different varieties of steel. 4
 - iii) a) Calculate the molecular weight of polymer having D.P. = 4500, where molecular weight of monomer is 56. 2
 b) Give properties and uses of two types of glass. 2



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Set

S

**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) An alloy having high electrical resistance and can be used in heating appliances is
A) Duralumin B) Brass C) Stainless steel D) Nichrome
 - 2) An organic polymer shows appreciable conductivity if polymer chain contains
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C) Only double bond D) Functional group
 - 3) The most widely used vulcanizing agent is
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 - 4) What is the normality of 1 litre solution containing 40 gm of NaOH ?
A) 1 N B) 4 N C) 2 N D) 0.1 N
 - 5) The detection of steroid drugs used by athletes can be carried out by
A) TGA B) DTA C) DSC D) GLC
 - 6) Aerobic oxidation is caused by
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B) Anaerobic bacterias in presence of insufficient O₂
C) Aerobic bacterias in absence of O₂
D) None of these
 - 7) A semipermeable membrane allow the flow of
A) Solvent molecules B) Solute molecules
C) Both A and B D) None of these

P.T.O.



- 8) A system consists of water in contact with its vapour, the degree of freedom is
A) Zero B) One C) Two D) Three
- 9) Machine operating at high temperatures and high loads are best lubricated by
A) Mineral oils B) Solid Lubricants
C) Greases D) Animal oils
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A) One B) Two C) Three D) Zero
- 11) Corrosion is an example of
A) Oxidation B) Reduction C) Electrolysis D) Erosion
- 12) Drying oils supply to paint film
A) Water Proofness B) Medium or Vehicle
C) Main film forming constituent D) All of these
- 13) Analysis of sulphur in coal is carried out by
A) Proximate analysis B) Ultimate analysis
C) Volumetric analysis D) None of these
- 14) The purest commercial form of iron is
A) Cast iron B) Steel C) Wrought iron D) Stainless steel
-



Seat No.	
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**F.E. (Part – I/II) (CGPA) Examination, 2016
ENGINEERING CHEMISTRY**

Day and Date : Friday, 23-12-2016
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** i) Attempt **all** questions.
ii) Draw **neat** diagrams **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : **8**

a) A sample of water on analysis has been found to contain the following impurities in ppm as

Impurities	Amount	Mole. Wt.
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CaCl ₂	4.93	111
Mg SO ₄	2.50	120

Calculate temporary, permanent and total hardness of water.

- b) Define aeration. Explain surface and gravity aerators with suitable diagram.
c) Draw and explain the important features of phase diagram of one component water system.

B) Attempt **any two** : **6**

- a) Define lubrication. Explain fluid film lubrication in detail.
b) Give an account of cathodic protection of corrosion by sacrificial anodic method.
c) Select the lubricant for :
i) Cutting tools
ii) Transformers
iii) Internal combustion engine.

3. A) Attempt **any two** : **6**

- a) Explain scales and sludge formation in boilers with its prevention measures.
b) Write a note on Galvanizing.
c) Define with examples :
i) Reduced phase rule
ii) Component
iii) Degree of freedom.

Set S



- B) Attempt **any two** : 8
- a) Write a note on co-agulation of H_2O .
 - b) Discuss the following as a lubricants :
 - i) Animal and vegetable oils
 - ii) Mineral oils.
 - c) Discuss the mechanism of wet corrosion by :
 - i) Hydrogen evolution method
 - ii) Oxygen absorption method.

SECTION – II

4. A) Attempt **any two** : 8
- a) Explain steps of setting and hardening of portland cement with chemical reactions.
 - b) Calculate HCV and LCV of a coal sample having the following composition
C = 75%, O = 5%, H = 6%, S = 0.8%, N = 3%, ash = 10.2%
Take latent heat of steam = 540 Kcal/Kg
 - c) Explain isolation of natural rubber from latex.
- B) Attempt **any two** : 6
- a) Draw a labelled block diagram of GLC.
 - b) Distinguish between addition and condensation polymerization.
 - c) Define
 - i) Calorific value
 - ii) Polymerization
 - iii) TGA.
5. A) i) Write compound constituents of portland cement. 3
 ii) What are advantages and disadvantages of gaseous fuel or solid fuel ? 3

OR

- A) i) What is the weight of $MgSO_4$ required to prepare 0.5 N solution of 750 ml ?
(Mole. Wt. of $MgSO_4 = 120$) 3
 ii) Write a note on polymers in medicine and surgery. 3
- B) Attempt **any two** : 8
- i) Explain construction and working of bomb calorimeter. 4
 - ii) Explain composition, properties and applications of different varieties of steel. 4
 - iii) a) Calculate the molecular weight of polymer having D.P. = 4500, where molecular weight of monomer is 56. 2
 b) Give properties and uses of two types of glass. 2



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Seat No.	
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Set	P
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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Q. No. **1** is **compulsory**. It should be solved in Answer Book Page No. **3**. **Each** question carries **one** mark.
3) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

- I) Which is a characteristic of city ?
a) Higher rate of unemployment
b) Based on agriculture
c) Small family size
d) Traditional nature of occupation
- II) Which is not a characteristic of a tribe ?
a) Common habitation
b) Sense of unity
c) Common origin
d) Different language
- III) What do you mean by sex ratio ?
a) No. of women per thousand
b) No. of women per hundred
c) Total no. of women
d) Total no. of men
- IV) The term sociology was for the first time coined by
a) Auguste Comte
b) Ginsberg
c) Aristotle
d) Socrates

P.T.O.



- V) Who has described society as a web of social relations ?
- a) Cooley
 - b) Mclver
 - c) Parsons
 - d) Leacock
- VI) Communities and associations are types of
- a) Social group
 - b) Aggregate
 - c) Society
 - d) Social category
- VII) The nature of urbanization is
- a) Pioneering
 - b) Static
 - c) Dynamic
 - d) Homogeneous
- VIII) Who has been a pioneer of Narmada Bachao Andolan (Movement) ?
- a) Anna Hazare
 - b) Megha Patkar
 - c) Sundarlal Bahuguna
 - d) J. P. Narayan
- IX) Which one of the following you categorise as achieved status ?
- a) Sex
 - b) Age
 - c) Caste
 - d) Social worker
- X) The basic characteristics of caste system is
- a) Inequality
 - b) Hierarchy
 - c) Equal status
 - d) Openness
-



Seat No.	
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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate full marks.

2. Define sociology and explain the concept of status. **10**
 3. Define concept of social mobility and elucidate types of social mobility. **10**
 4. What is population dividend ? Explain its positive impact on society. **10**
 5. What is social movement ? Elucidate the significance of environmental movements in India. **10**
 6. Discuss the key characteristics of industry as a formal organization. **10**
 7. Define the concept of social institution and explain the functions of family institution. **10**
-



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Seat No.	
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Set	Q
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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
3) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

- I) Which one of the following you categorise as achieved status ?
a) Sex
b) Age
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d) Social worker
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b) Hierarchy
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d) Openness
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c) Dynamic
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P.T.O.



- IV) Who has been a pioneer of Narmada Bachao Andolan (Movement) ?
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 - Sense of unity
 - Common origin
 - Different language
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- No. of women per thousand
 - No. of women per hundred
 - Total no. of women
 - Total no. of men
- VIII) The term sociology was for the first time coined by
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- IX) Who has described society as a web of social relations ?
- Cooley
 - Mclver
 - Parsons
 - Leacock
- X) Communities and associations are types of
- Social group
 - Aggregate
 - Society
 - Social category
-



Seat No.	
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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate full marks.

2. Define sociology and explain the concept of status. **10**
 3. Define concept of social mobility and elucidate types of social mobility. **10**
 4. What is population dividend ? Explain its positive impact on society. **10**
 5. What is social movement ? Elucidate the significance of environmental movements in India. **10**
 6. Discuss the key characteristics of industry as a formal organization. **10**
 7. Define the concept of social institution and explain the functions of family institution. **10**
-



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Seat No.	
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Set	R
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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
3) **Answer MCQ/Objective type questions on Page No. 3 only.**
Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

- I) Who has described society as a web of social relations ?
a) Cooley
b) Mclver
c) Parsons
d) Leacock
- II) Communities and associations are types of
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b) Aggregate
c) Society
d) Social category
- III) Which one of the following you categorise as achieved status ?
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b) Age
c) Caste
d) Social worker

P.T.O.



- IV) The basic characteristics of caste system is
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 - Hierarchy
 - Equal status
 - Openness
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- No. of women per thousand
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 - Sense of unity
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- Anna Hazare
 - Megha Patkar
 - Sundarlal Bahuguna
 - J. P. Narayan
-



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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate full marks.

2. Define sociology and explain the concept of status. **10**
 3. Define concept of social mobility and elucidate types of social mobility. **10**
 4. What is population dividend ? Explain its positive impact on society. **10**
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 6. Discuss the key characteristics of industry as a formal organization. **10**
 7. Define the concept of social institution and explain the functions of family institution. **10**
-



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Seat No.	
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Set	S
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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
3) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

- I) What do you mean by sex ratio ?
a) No. of women per thousand
b) No. of women per hundred
c) Total no. of women
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- II) The term sociology was for the first time coined by
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c) Parsons
d) Leacock
- IV) Communities and associations are types of
a) Social group
b) Aggregate
c) Society
d) Social category

P.T.O.



- V) The nature of urbanization is
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 - d) Traditional nature of occupation
- X) Which is not a characteristic of a tribe ?
- a) Common habitation
 - b) Sense of unity
 - c) Common origin
 - d) Different language
-



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T.E. (Part – I) (All Branches) Examination, 2016
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate full marks.

2. Define sociology and explain the concept of status. **10**
 3. Define concept of social mobility and elucidate types of social mobility. **10**
 4. What is population dividend ? Explain its positive impact on society. **10**
 5. What is social movement ? Elucidate the significance of environmental movements in India. **10**
 6. Discuss the key characteristics of industry as a formal organization. **10**
 7. Define the concept of social institution and explain the functions of family institution. **10**
-



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T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN VALUES

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures at **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose the correct answer :

- 1) _____ is not a moral duty.
A) To vote the local government B) To keep surroundings clean
C) Not to pollute water D) To pay taxes
- 2) Kohlberg theory is related to
A) Moral Development B) Human values
C) Motivation D) Team working
- 3) H R means
A) Human Resource B) Honorary Responsibility
C) Head Resource D) Human Resistance
- 4) An identity of specific goods and services permitting the differences to be made among different trades is called as
A) Copyright B) Trademark
C) Patent D) None of above
- 5) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
A) Commitment B) Co-operation
C) Empathy D) Confidence

P.T.O.



- 6) _____ is not the part of internal communication.
- A) Internal newsletters
 - B) Mailers
 - C) Electronic mails
 - D) Advertise and market honoring values
- 7) FMEA is a tool of
- A) Financial analysis
 - B) Risk analysis
 - C) Equity analysis
 - D) None of above
- 8) Patent is given to
- A) A product or a process
 - B) Art
 - C) Service
 - D) None of above
- 9) In FMEA, F stands for
- A) Fatigue
 - B) Force
 - C) Free
 - D) Failure
- 10) _____ is not the requirement for engineer as an advisor.
- A) Objectivity
 - B) Study all aspects
 - C) Values
 - D) Sympathy bias
-



Seat No.	
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**T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Figures at **right** indicate **full** marks.
2) Solve **any 4** questions out of Q.No. 2 to Q.No. 7.

2. Explain the meaning of professional ethics. Also explain objectives of studying the professional ethics and human values. **10**
 3. Explain variety of moral issues. **10**
 4. What are the engineering ethics ? Explain the approach and scope of the same. **10**
 5. Explain the risk benefits analysis. **10**
 6. Explain collective bargaining. **10**
 7. Differentiate between Kohlberg's Theory and Gilligan's Theory. **10**
-



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Seat No.	
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Set	Q
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T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN VALUES

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures at **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose the correct answer :

- 1) In FMEA, F stands for
A) Fatigue B) Force C) Free D) Failure
- 2) _____ is not the requirement for engineer as an advisor.
A) Objectivity B) Study all aspects
C) Values D) Sympathy bias
- 3) FMEA is a tool of
A) Financial analysis B) Risk analysis
C) Equity analysis D) None of above
- 4) Patent is given to
A) A product or a process B) Art
C) Service D) None of above
- 5) _____ is not a moral duty.
A) To vote the local government B) To keep surroundings clean
C) Not to pollute water D) To pay taxes
- 6) Kohlberg theory is related to
A) Moral Development B) Human values
C) Motivation D) Team working

P.T.O.



- 7) H R means
- | | |
|-------------------|----------------------------|
| A) Human Resource | B) Honorary Responsibility |
| C) Head Resource | D) Human Resistance |
- 8) An identity of specific goods and services permitting the differences to be made among different trades is called as
- | | |
|--------------|------------------|
| A) Copyright | B) Trademark |
| C) Patent | D) None of above |
- 9) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
- | | |
|---------------|-----------------|
| A) Commitment | B) Co-operation |
| C) Empathy | D) Confidence |
- 10) _____ is not the part of internal communication.
- | |
|---|
| A) Internal newsletters |
| B) Mailers |
| C) Electronic mails |
| D) Advertise and market honoring values |
-



Seat No.	
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**T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Figures at **right** indicate **full** marks.
2) Solve **any 4** questions out of Q.No. 2 to Q.No. 7.

2. Explain the meaning of professional ethics. Also explain objectives of studying the professional ethics and human values. **10**
 3. Explain variety of moral issues. **10**
 4. What are the engineering ethics ? Explain the approach and scope of the same. **10**
 5. Explain the risk benefits analysis. **10**
 6. Explain collective bargaining. **10**
 7. Differentiate between Kohlberg's Theory and Gilligan's Theory. **10**
-



SLR-EP – 602

Seat No.	
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Set	R
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T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN VALUES

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures at **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose the correct answer :

- 1) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
 - A) Commitment
 - B) Co-operation
 - C) Empathy
 - D) Confidence
- 2) _____ is not the part of internal communication.
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- 3) In FMEA, F stands for
 - A) Fatigue
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- 4) _____ is not the requirement for engineer as an advisor.
 - A) Objectivity
 - B) Study all aspects
 - C) Values
 - D) Sympathy bias
- 5) H R means
 - A) Human Resource
 - B) Honorary Responsibility
 - C) Head Resource
 - D) Human Resistance

P.T.O.



- 6) An identity of specific goods and services permitting the differences to be made among different trades is called as
- A) Copyright
 - B) Trademark
 - C) Patent
 - D) None of above
- 7) _____ is not a moral duty.
- A) To vote the local government
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 - C) Not to pollute water
 - D) To pay taxes
- 8) Kohlberg theory is related to
- A) Moral Development
 - B) Human values
 - C) Motivation
 - D) Team working
- 9) FMEA is a tool of
- A) Financial analysis
 - B) Risk analysis
 - C) Equity analysis
 - D) None of above
- 10) Patent is given to
- A) A product or a process
 - B) Art
 - C) Service
 - D) None of above
-



Seat No.	
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**T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Figures at **right** indicate **full** marks.
2) Solve **any 4** questions out of Q.No. 2 to Q.No. 7.

2. Explain the meaning of professional ethics. Also explain objectives of studying the professional ethics and human values. **10**
 3. Explain variety of moral issues. **10**
 4. What are the engineering ethics ? Explain the approach and scope of the same. **10**
 5. Explain the risk benefits analysis. **10**
 6. Explain collective bargaining. **10**
 7. Differentiate between Kohlberg's Theory and Gilligan's Theory. **10**
-



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T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN VALUES

Day and Date : Saturday, 10-12-2016

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures at **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose the correct answer :

1) H R means

- A) Human Resource
C) Head Resource

- B) Honorary Responsibility
D) Human Resistance

2) An identity of specific goods and services permitting the differences to be made among different trades is called as

- A) Copyright
C) Patent

- B) Trademark
D) None of above

3) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as

- A) Commitment
C) Empathy

- B) Co-operation
D) Confidence

4) _____ is not the part of internal communication.

- A) Internal newsletters
B) Mailers
C) Electronic mails
D) Advertise and market honoring values

P.T.O.



- 5) FMEA is a tool of
A) Financial analysis B) Risk analysis
C) Equity analysis D) None of above
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A) A product or a process B) Art
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A) Fatigue B) Force C) Free D) Failure
- 8) _____ is not the requirement for engineer as an advisor.
A) Objectivity B) Study all aspects
C) Values D) Sympathy bias
- 9) _____ is not a moral duty.
A) To vote the local government B) To keep surroundings clean
C) Not to pollute water D) To pay taxes
- 10) Kohlberg theory is related to
A) Moral Development B) Human values
C) Motivation D) Team working
-



Seat No.	
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**T.E. (All Branches) (Part – I) Examination, 2016
SELF LEARNING (HSS) : PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Figures at **right** indicate **full** marks.
2) Solve **any 4** questions out of Q.No. 2 to Q.No. 7.

2. Explain the meaning of professional ethics. Also explain objectives of studying the professional ethics and human values. **10**
 3. Explain variety of moral issues. **10**
 4. What are the engineering ethics ? Explain the approach and scope of the same. **10**
 5. Explain the risk benefits analysis. **10**
 6. Explain collective bargaining. **10**
 7. Differentiate between Kohlberg's Theory and Gilligan's Theory. **10**
-



SLR-EP – 603

Seat No.	
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Set **P**

**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :**
- 1) Attempt **any 4** out of Q. 2 to Q. 7.
 - 2) **All** questions carry **equal** marks.
 - 3) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers : 10
- 1) Economics is a _____ science.
 - a) Positive
 - b) Normative
 - c) Both (a) and (b)
 - d) None of the above
 - 2) Product differentiation is a characteristics of _____ market.
 - a) Perfect competition
 - b) Monopoly
 - c) Monopolistic competition
 - d) Price competition
 - 3) _____ is the subject matter of micro economics.
 - a) National Income
 - b) Fiscal Policy
 - c) Monetary Policy
 - d) Theory of Consumer's Choice
 - 4) Gross National Income – Depreciation = ?
 - a) Net National Income
 - b) Disposable Income
 - c) Net Domestic Income
 - d) Personal Income
 - 5) Supply of money is
 - a) A stock concept
 - b) A flow concept
 - c) Both stock and flow concept
 - d) Neither a stock nor a flow concept

P.T.O.



- 6) A firm in a perfectly competitive market faces
- a) A perfectly elastic demand function
 - b) A perfectly inelastic demand function
 - c) A demand function with unitary elasticity
 - d) None of the above
- 7) The most important determinant of consumer spending is _____
- a) The level of household debt
 - b) Consumer expectations
 - c) The stock of wealth
 - d) The level of income
- 8) Investment and saving are, respectively _____
- a) Income and wealth
 - b) Stocks and flows
 - c) Injections and leakages
 - d) Leakages and injections
- 9) Which of the following is NOT an account in the Balance of Payments ?
- a) Current Account
 - b) Capital Account
 - c) Financial Account
 - d) Future Account
- 10) Automatic correction in balance of payment is the main advantage of _____
- a) Fixed exchange rate system
 - b) Flexible exchange rate system
 - c) Peg exchange rate system
 - d) None of the above
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions: 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.

2. Write short notes : 10
 - 1) Functions of Central Banking
 - 2) Fiscal Policy.
 3. Write short notes : 10
 - 1) Exchange Rate
 - 2) Monopoly.
 4. What is meant by economic policy ? Discuss features of new economic policy in India. 10
 5. Define perfect competition, explain the features of perfect competition. 10
 6. What is balance of payment disequilibrium ? Discuss measures to correct disequilibrium in balance of payment. 10
 7. What is inflation ? Discuss fiscal and monetary measure to control inflation. 10
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Seat No.	
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Set	Q
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.
3) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers : 10
- 1) The most important determinant of consumer spending is _____
 - a) The level of household debt
 - b) Consumer expectations
 - c) The stock of wealth
 - d) The level of income
 - 2) Investment and saving are, respectively _____
 - a) Income and wealth
 - b) Stocks and flows
 - c) Injections and leakages
 - d) Leakages and injections
 - 3) Which of the following is NOT an account in the Balance of Payments ?
 - a) Current Account
 - b) Capital Account
 - c) Financial Account
 - d) Future Account
 - 4) Automatic correction in balance of payment is the main advantage of _____
 - a) Fixed exchange rate system
 - b) Flexible exchange rate system
 - c) Peg exchange rate system
 - d) None of the above

P.T.O.



- 5) Economics is a _____ science.
- a) Positive b) Normative
c) Both (a) and (b) d) None of the above
- 6) Product differentiation is a characteristics of _____ market.
- a) Perfect competition b) Monopoly
c) Monopolistic competition d) Price competition
- 7) _____ is the subject matter of micro economics.
- a) National Income b) Fiscal Policy
c) Monetary Policy d) Theory of Consumer's Choice
- 8) Gross National Income – Depreciation = ?
- a) Net National Income b) Disposable Income
c) Net Domestic Income d) Personal Income
- 9) Supply of money is
- a) A stock concept b) A flow concept
c) Both stock and flow concept d) Neither a stock nor a flow concept
- 10) A firm in a perfectly competitive market faces
- a) A perfectly elastic demand function
b) A perfectly inelastic demand function
c) A demand function with unitary elasticity
d) None of the above
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Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions: 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.

2. Write short notes : 10
 - 1) Functions of Central Banking
 - 2) Fiscal Policy.
 3. Write short notes : 10
 - 1) Exchange Rate
 - 2) Monopoly.
 4. What is meant by economic policy ? Discuss features of new economic policy in India. 10
 5. Define perfect competition, explain the features of perfect competition. 10
 6. What is balance of payment disequilibrium ? Discuss measures to correct disequilibrium in balance of payment. 10
 7. What is inflation ? Discuss fiscal and monetary measure to control inflation. 10
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SLR-EP – 603

Seat No.	
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Set	R
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.
3) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers :

10

- 1) Supply of money is
 - a) A stock concept
 - b) A flow concept
 - c) Both stock and flow concept
 - d) Neither a stock nor a flow concept
- 2) A firm in a perfectly competitive market faces
 - a) A perfectly elastic demand function
 - b) A perfectly inelastic demand function
 - c) A demand function with unitary elasticity
 - d) None of the above
- 3) Which of the following is NOT an account in the Balance of Payments ?
 - a) Current Account
 - b) Capital Account
 - c) Financial Account
 - d) Future Account
- 4) Automatic correction in balance of payment is the main advantage of _____
 - a) Fixed exchange rate system
 - b) Flexible exchange rate system
 - c) Peg exchange rate system
 - d) None of the above

P.T.O.



- 5) _____ is the subject matter of micro economics.
- a) National Income b) Fiscal Policy
c) Monetary Policy d) Theory of Consumer's Choice
- 6) Gross National Income – Depreciation = ?
- a) Net National Income b) Disposable Income
c) Net Domestic Income d) Personal Income
- 7) Economics is a _____ science.
- a) Positive b) Normative
c) Both (a) and (b) d) None of the above
- 8) Product differentiation is a characteristics of _____ market.
- a) Perfect competition b) Monopoly
c) Monopolistic competition d) Price competition
- 9) The most important determinant of consumer spending is _____
- a) The level of household debt b) Consumer expectations
c) The stock of wealth d) The level of income
- 10) Investment and saving are, respectively _____
- a) Income and wealth b) Stocks and flows
c) Injections and leakages d) Leakages and injections
- _____



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions: 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.

2. Write short notes : 10
 - 1) Functions of Central Banking
 - 2) Fiscal Policy.
 3. Write short notes : 10
 - 1) Exchange Rate
 - 2) Monopoly.
 4. What is meant by economic policy ? Discuss features of new economic policy in India. 10
 5. Define perfect competition, explain the features of perfect competition. 10
 6. What is balance of payment disequilibrium ? Discuss measures to correct disequilibrium in balance of payment. 10
 7. What is inflation ? Discuss fiscal and monetary measure to control inflation. 10
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Seat No.	
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Set	S
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.
3) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers : 10
- 1) _____ is the subject matter of micro economics.
 - a) National Income
 - b) Fiscal Policy
 - c) Monetary Policy
 - d) Theory of Consumer's Choice
 - 2) Gross National Income – Depreciation = ?
 - a) Net National Income
 - b) Disposable Income
 - c) Net Domestic Income
 - d) Personal Income
 - 3) Supply of money is
 - a) A stock concept
 - b) A flow concept
 - c) Both stock and flow concept
 - d) Neither a stock nor a flow concept
 - 4) A firm in a perfectly competitive market faces
 - a) A perfectly elastic demand function
 - b) A perfectly inelastic demand function
 - c) A demand function with unitary elasticity
 - d) None of the above

P.T.O.



- 5) The most important determinant of consumer spending is _____
- a) The level of household debt b) Consumer expectations
c) The stock of wealth d) The level of income
- 6) Investment and saving are, respectively _____
- a) Income and wealth b) Stocks and flows
c) Injections and leakages d) Leakages and injections
- 7) Which of the following is NOT an account in the Balance of Payments ?
- a) Current Account b) Capital Account
c) Financial Account d) Future Account
- 8) Automatic correction in balance of payment is the main advantage of _____
- a) Fixed exchange rate system
b) Flexible exchange rate system
c) Peg exchange rate system
d) None of the above
- 9) Economics is a _____ science.
- a) Positive b) Normative
c) Both (a) and (b) d) None of the above
- 10) Product differentiation is a characteristics of _____ market.
- a) Perfect competition b) Monopoly
c) Monopolistic competition d) Price competition
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
ECONOMICS
(Self Learning – H.S.S.)**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions: 1) Attempt **any 4** out of Q. 2 to Q. 7.
2) **All** questions carry **equal** marks.

2. Write short notes : 10
 - 1) Functions of Central Banking
 - 2) Fiscal Policy.
 3. Write short notes : 10
 - 1) Exchange Rate
 - 2) Monopoly.
 4. What is meant by economic policy ? Discuss features of new economic policy in India. 10
 5. Define perfect competition, explain the features of perfect competition. 10
 6. What is balance of payment disequilibrium ? Discuss measures to correct disequilibrium in balance of payment. 10
 7. What is inflation ? Discuss fiscal and monetary measure to control inflation. 10
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SLR-EP – 604

Seat No.	
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Set	P
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- Instructions :** i) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. A) Choose the correct answers :

5

- 1) There are _____ and _____ strategies to cope with stress.
 - a) Individual and organisational
 - b) Personal and interpersonal
 - c) occupational and job level
 - d) Inter personal and intrapersonal
- 2) _____ is the confusion about the expectation of the role one occupies.
 - a) Role stagnation
 - b) Role Isolation
 - c) Role erosion
 - d) Role ambiguity
- 3) Stress is _____ related to performance.
 - a) Positively
 - b) Negatively
 - c) Proportionately
 - d) None of these
- 4) Lack of cohesiveness is _____ stressor.
 - a) Individual level
 - b) Organisational level
 - c) Group level
 - d) Extra organisational level
- 5) Absenteeism, turnover and less productivity are _____ symptoms of stress.
 - a) Medical
 - b) Psychological
 - c) Behavioural
 - d) None of these

P.T.O.



B) Match the pairs :

5

Set "A"

- 1) Psychological systems
- 2) Physiological symptoms
- 3) Individual factors
- 4) Organisational factors
- 5) Environmental factors

Set "B"

- 1) Organisational stressors
 - 2) Political uncertainty
 - 3) High blood pressure
 - 4) Family problems
 - 5) Anxiety
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instruction : Solve **any 4** from Q. No. **2** to Q. No. **7**.

2. Define stress and explain current and historical status of stress. **10**
 3. Explain common sources of stress in detail. **10**
 4. Elaborate the various consequences of stress. **10**
 5. Explain the various stress management techniques. **10**
 6. Discuss the nature of stress response. **10**
 7. What does the role of social support play in mitigating stress? **10**
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Seat No.	
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Set	Q
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

Instructions : i) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. A) Choose the correct answers :

5

- 1) Lack of cohesiveness is _____ stressor.
 - a) Individual level
 - b) Organisational level
 - c) Group level
 - d) Extra organisational level
- 2) Absenteeism, turnover and less productivity are _____ symptoms of stress.
 - a) Medical
 - b) Psychological
 - c) Behavioural
 - d) None of these
- 3) There are _____ and _____ strategies to cope with stress.
 - a) Individual and organisational
 - b) Personal and interpersonal
 - c) occupational and job level
 - d) Inter personal and intrapersonal
- 4) _____ is the confusion about the expectation of the role one occupies.
 - a) Role stagnation
 - b) Role Isolation
 - c) Role erosion
 - d) Role ambiguity
- 5) Stress is _____ related to performance.
 - a) Positively
 - b) Negatively
 - c) Proportionately
 - d) None of these

P.T.O.



B) Match the pairs :

5

Set "A"

Set "B"

- 1) Psychological systems
- 2) Physiological symptoms
- 3) Individual factors
- 4) Organisational factors
- 5) Environmental factors

- 1) Organisational stressors
 - 2) Political uncertainty
 - 3) High blood pressure
 - 4) Family problems
 - 5) Anxiety
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instruction : Solve **any 4** from Q. No. **2** to Q. No. **7**.

2. Define stress and explain current and historical status of stress. **10**
 3. Explain common sources of stress in detail. **10**
 4. Elaborate the various consequences of stress. **10**
 5. Explain the various stress management techniques. **10**
 6. Discuss the nature of stress response. **10**
 7. What does the role of social support play in mitigating stress? **10**
-



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Set	R
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

Instructions : i) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. A) Choose the correct answers :

5

- 1) Stress is _____ related to performance.
 - a) Positively
 - b) Negatively
 - c) Proportionately
 - d) None of these
- 2) Lack of cohesiveness is _____ stressor.
 - a) Individual level
 - b) Organisational level
 - c) Group level
 - d) Extra organisational level
- 3) Absenteeism, turnover and less productivity are _____ symptoms of stress.
 - a) Medical
 - b) Psychological
 - c) Behavioural
 - d) None of these
- 4) There are _____ and _____ strategies to cope with stress.
 - a) Individual and organisational
 - b) Personal and interpersonal
 - c) occupational and job level
 - d) Inter personal and intrapersonal
- 5) _____ is the confusion about the expectation of the role one occupies.
 - a) Role stagnation
 - b) Role Isolation
 - c) Role erosion
 - d) Role ambiguity

P.T.O.



B) Match the pairs :

5

Set "A"

Set "B"

- 1) Psychological systems
- 2) Physiological symptoms
- 3) Individual factors
- 4) Organisational factors
- 5) Environmental factors

- 1) Organisational stressors
- 2) Political uncertainty
- 3) High blood pressure
- 4) Family problems
- 5) Anxiety





Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instruction : Solve **any 4** from Q. No. **2** to Q. No. **7**.

2. Define stress and explain current and historical status of stress. **10**
 3. Explain common sources of stress in detail. **10**
 4. Elaborate the various consequences of stress. **10**
 5. Explain the various stress management techniques. **10**
 6. Discuss the nature of stress response. **10**
 7. What does the role of social support play in mitigating stress? **10**
-



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Seat No.	
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Set	S
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- Instructions :** i) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. A) Choose the correct answers :

5

- 1) _____ is the confusion about the expectation of the role one occupies.
 - a) Role stagnation
 - b) Role Isolation
 - c) Role erosion
 - d) Role ambiguity
- 2) Stress is _____ related to performance.
 - a) Positively
 - b) Negatively
 - c) Proportionately
 - d) None of these
- 3) Lack of cohesiveness is _____ stressor.
 - a) Individual level
 - b) Organisational level
 - c) Group level
 - d) Extra organisational level
- 4) Absenteeism, turnover and less productivity are _____ symptoms of stress.
 - a) Medical
 - b) Psychological
 - c) Behavioural
 - d) None of these
- 5) There are _____ and _____ strategies to cope with stress.
 - a) Individual and organisational
 - b) Personal and interpersonal
 - c) occupational and job level
 - d) Inter personal and intrapersonal

P.T.O.



B) Match the pairs :

5

Set "A"

Set "B"

- 1) Psychological systems
- 2) Physiological symptoms
- 3) Individual factors
- 4) Organisational factors
- 5) Environmental factors

- 1) Organisational stressors
- 2) Political uncertainty
- 3) High blood pressure
- 4) Family problems
- 5) Anxiety





Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
SELF LEARNING (HSS)
Stress And Coping**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instruction : Solve **any 4** from Q. No. **2** to Q. No. **7**.

2. Define stress and explain current and historical status of stress. **10**
 3. Explain common sources of stress in detail. **10**
 4. Elaborate the various consequences of stress. **10**
 5. Explain the various stress management techniques. **10**
 6. Discuss the nature of stress response. **10**
 7. What does the role of social support play in mitigating stress? **10**
-



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Seat No.	
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Set

P

**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :**
- 1) Attempt **all** questions.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. **1** is **compulsory**. It should be solved in Answer Book Page No. **3**. Each question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers : **(10×1=10)**

- 1) To apply for a patent, an inventor must
 - a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above
- 2) All of the following are examples of intellectual property protections except
 - a) Copyrights
 - b) Patents
 - c) Contracts
 - d) Trademarks
- 3) A person develops a new process for making butter from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
 - a) Patent
 - b) Copyright
 - c) Trademarks
 - d) Industrial Design
- 4) What is the term of a patent ?
 - a) 35 years
 - b) 25 years
 - c) 20 years
 - d) 15 years

P.T.O.



- 5) No patent shall be granted in respect of an invention relating to
a) Atomic Energy b) Bio Energy c) Solar Energy d) Wind Energy
- 6) The first Patent Law was enacted in India in the year
a) 1856 b) 1880 c) 1905 d) 1850
- 7) Which of the following is not specifically protected by intellectual property legislation ?
a) Industrial Designs b) Trademarks
c) Copyrights d) Trade secrets
- 8) Intellectual Property Rights are result of
a) Mental Work b) Physical Work
c) Technical Work d) Communication
- 9) The legislation covering intellectual property right in India for Information Technology is
a) Information Technology Act 2003
b) Information Technology Act 2000
c) Information Technology Act 2003
d) Information Technology Act 2008
- 10) What is copyright meant for ?
a) Film Work b) Books
c) Essay d) All the above
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Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016

Marks : 40

Time : 10.00 a.m. to 12.00 noon

N.B. : 1) Attempt **all** questions.
2) Figures to the **right** indicate **full** marks.

2. Explain in detail Indian Patent Act, 1970. 10
3. Elaborate the copyright issues in creative works. 10

OR

Explain process patent registration. 10

4. Write short notes on **any four** : 20
- 1) Copyrights.
 - 2) Trade secrets.
 - 3) Biotechnology and intellectual property.
 - 4) Publication and examination of patent applications.
 - 5) Protection of traditional knowledge.
 - 6) Essential requirements for granting patent.
-



SLR-EP – 605

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Set

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**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :** 1) Attempt **all** questions.
2) Figures to the **right** indicate **full** marks.
3) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers :

(10×1=10)

- 1) The legislation covering intellectual property right in India for Information Technology is
 - a) Information Technology Act 2003
 - b) Information Technology Act 2000
 - c) Information Technology Act 2003
 - d) Information Technology Act 2008
- 2) What is copyright meant for ?
 - a) Film Work
 - b) Books
 - c) Essay
 - d) All the above
- 3) Which of the following is not specifically protected by intellectual property legislation ?
 - a) Industrial Designs
 - b) Trademarks
 - c) Copyrights
 - d) Trade secrets
- 4) Intellectual Property Rights are result of
 - a) Mental Work
 - b) Physical Work
 - c) Technical Work
 - d) Communication

P.T.O.



- 5) To apply for a patent, an inventor must
- a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above
- 6) All of the following are examples of intellectual property protections except
- a) Copyrights
 - b) Patents
 - c) Contracts
 - d) Trademarks
- 7) A person develops a new process for making butter from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
- a) Patent
 - b) Copyright
 - c) Trademarks
 - d) Industrial Design
- 8) What is the term of a patent ?
- a) 35 years
 - b) 25 years
 - c) 20 years
 - d) 15 years
- 9) No patent shall be granted in respect of an invention relating to
- a) Atomic Energy
 - b) Bio Energy
 - c) Solar Energy
 - d) Wind Energy
- 10) The first Patent Law was enacted in India in the year
- a) 1856
 - b) 1880
 - c) 1905
 - d) 1850
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016

Marks : 40

Time : 10.00 a.m. to 12.00 noon

N.B. : 1) Attempt **all** questions.
2) Figures to the **right** indicate **full** marks.

2. Explain in detail Indian Patent Act, 1970. 10
3. Elaborate the copyright issues in creative works. 10

OR

Explain process patent registration. 10

4. Write short notes on **any four** : 20
- 1) Copyrights.
 - 2) Trade secrets.
 - 3) Biotechnology and intellectual property.
 - 4) Publication and examination of patent applications.
 - 5) Protection of traditional knowledge.
 - 6) Essential requirements for granting patent.
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SLR-EP – 605

Seat No.	
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Set **R**

**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :**
- 1) Attempt **all** questions.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. **1** is **compulsory**. It should be solved in Answer Book Page No. **3**. Each question carries **one** mark.
 - 4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers :

(10×1=10)

- 1) No patent shall be granted in respect of an invention relating to
a) Atomic Energy b) Bio Energy c) Solar Energy d) Wind Energy
- 2) The first Patent Law was enacted in India in the year
a) 1856 b) 1880 c) 1905 d) 1850
- 3) The legislation covering intellectual property right in India for Information Technology is
a) Information Technology Act 2003
b) Information Technology Act 2000
c) Information Technology Act 2003
d) Information Technology Act 2008
- 4) What is copyright meant for ?
a) Film Work b) Books
c) Essay d) All the above
- 5) A person develops a new process for making butter from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
a) Patent b) Copyright
c) Trademarks d) Industrial Design

P.T.O.



- 6) What is the term of a patent ?
 - a) 35 years
 - b) 25 years
 - c) 20 years
 - d) 15 years
 - 7) To apply for a patent, an inventor must
 - a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above
 - 8) All of the following are examples of intellectual property protections except
 - a) Copyrights
 - b) Patents
 - c) Contracts
 - d) Trademarks
 - 9) Which of the following is not specifically protected by intellectual property legislation ?
 - a) Industrial Designs
 - b) Trademarks
 - c) Copyrights
 - d) Trade secrets
 - 10) Intellectual Property Rights are result of
 - a) Mental Work
 - b) Physical Work
 - c) Technical Work
 - d) Communication
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Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016

Marks : 40

Time : 10.00 a.m. to 12.00 noon

N.B. : 1) Attempt **all** questions.
2) Figures to the **right** indicate **full** marks.

2. Explain in detail Indian Patent Act, 1970. 10
3. Elaborate the copyright issues in creative works. 10

OR

- Explain process patent registration. 10
4. Write short notes on **any four** : 20
- 1) Copyrights.
 - 2) Trade secrets.
 - 3) Biotechnology and intellectual property.
 - 4) Publication and examination of patent applications.
 - 5) Protection of traditional knowledge.
 - 6) Essential requirements for granting patent.
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SLR-EP – 605

Seat No.	
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Set

S

**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :** 1) Attempt **all** questions.
2) Figures to the **right** indicate **full** marks.
3) Q. No. **1** is **compulsory**. It should be solved in Answer Book Page No. **3**. Each question carries **one** mark.
4) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answers : **(10×1=10)**
- 1) A person develops a new process for making butter from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
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b) Copyright
c) Trademarks
d) Industrial Design
 - 2) What is the term of a patent ?
a) 35 years
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a) Industrial Designs
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d) Trade secrets
 - 6) Intellectual Property Rights are result of
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c) Technical Work
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P.T.O.



- 7) The legislation covering intellectual property right in India for Information Technology is
 - a) Information Technology Act 2003
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 - 10) All of the following are examples of intellectual property protections except
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**T.E. (Part – I) (All Branches) Examination, 2016
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT (Self Learning (HSS))**

Day and Date : Saturday, 10-12-2016

Marks : 40

Time : 10.00 a.m. to 12.00 noon

N.B. : 1) Attempt **all** questions.
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