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**F.Y. B.Tech. (Semester – I) (CBCS) Examination, 2018
ENGINEERING MATHEMATICS – I (New)**

Day and Date : Monday, 3-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 1) Figures to the **right** indicate **full** marks.
2) **Use** of calculator is **allowed**.
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) The n^{th} derivative of $\frac{1}{x}$ is _____
- a) $\frac{(-1)^n n!}{x^{n+1}}$ b) $\frac{(-1)^n n!}{x^n}$ c) $\frac{(-1)^n (n-1)!}{x^n}$ d) $\frac{(-1)^n (n-1)!}{x^{n+1}}$
- 2) If $y = \sin^{-1}x$, then $x =$ _____
- a) $1 + y + \frac{y^2}{2!} + \frac{y^3}{3!} + \dots$ b) $1 - y + \frac{y^2}{2!} - \frac{y^3}{3!} + \dots$
- c) $y - \frac{y^3}{3!} + \frac{y^5}{5!} \dots$ d) $y + \frac{y^3}{3!} + \frac{y^5}{5!} + \dots$
- 3) If $y = x \sin x$, then $y_n =$ _____
- a) $\sin\left(x + n\frac{\pi}{2}\right)$ b) $x \sin\left(x + \frac{n\pi}{2}\right)$
- c) $x \cos\left(x + n\frac{\pi}{2}\right) + n \cos\left(x + (n-1)\frac{\pi}{2}\right)$ d) $x \sin\left(x + n\frac{\pi}{2}\right) + n \sin\left(x + (n-1)\frac{\pi}{2}\right)$
- 4) The expansion of e^x in powers of $(x-1)$ is _____
- a) $1 + (x-1) + \frac{(x-1)^2}{2!} + \dots \infty$ b) $e\left[1 + (x-1) + \frac{(x-1)^2}{2!} + \dots \infty\right]$
- c) $e\left[1 - (x-1) + \frac{(x-1)^2}{2!} \dots \infty\right]$ d) None of these



- 5) The rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is _____
- a) 0 b) 1 c) 2 d) 3
- 6) The system $AX = B$, where A is square matrix, has a unique solution, if
- a) $|A| = 0$ b) $|A| \neq 0$ c) $|A| = -|A|$ d) None of these
- 7) If the eigen values of a matrix A are 2, 3, 4, then the eigen values of A^{-1} are
- a) 2, $\frac{1}{3}$, 4 b) $\frac{1}{2}$, 3, 4 c) 2, 3, $\frac{1}{4}$ d) $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$
- 8) If $f(x, y) = x^{\frac{1}{3}}y^{-\frac{2}{3}} + x^{\frac{2}{3}}y^{-\frac{1}{3}}$, then f is homogeneous of degree
- a) $\frac{1}{3}$ b) 1 c) $\frac{2}{3}$ d) None of these
- 9) If $x = r \cos\theta$, $y = r \sin\theta$, then $\frac{\partial(x, y)}{\partial(r, \theta)} =$
- a) 0 b) r c) $\frac{1}{r^2}$ d) r^2
- 10) If ∂x is the error in x , then $\frac{\partial x}{x}$ is called
- a) positive error b) percentage error
c) relative error d) none of these
- 11) The necessary conditions for $f(x, y) = 0$ to have extremum are
- a) $f_{xy} = 0, f_{yx} = 0$ b) $f_{xx} = 0, f_{yy} = 0$
c) $f_x = 0, f_y = 0$ d) $f_x = 0, f_y = 0, f_{xx} > 0, f_{yy} > 0$
- 12) The unit tangent to the curve $x = t, y = t^2, z = t^3$ at point $(-1, 1, -1)$ is
- a) $\frac{1}{\sqrt{14}}(i + 2j + 3k)$ b) $\frac{1}{\sqrt{14}}(i - 2j + 3k)$
c) $\frac{1}{\sqrt{3}}(i + j + k)$ d) $\frac{1}{\sqrt{3}}(i - j + k)$
- 13) If $\vec{r} = xi + yj + zk$, then $\text{curl } \vec{r} =$
- a) 3 b) $\frac{1}{3}$ c) 0 d) Does not exist
- 14) A vector function \vec{F} is called solenoidal if
- a) $\text{div } \vec{F} = 0$ b) $\text{curl } \vec{F} = 0$ c) $\text{grad } \vec{F} = 0$ d) $\nabla^2 \vec{F} = 0$



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**F.Y. B.Tech. (Semester – I) (CBCS) Examination, 2018
ENGINEERING MATHEMATICS – I (New)**

Day and Date : Monday, 3-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

N.B. : 1) Figures to the **right** indicate **full** marks.
2) **Use** of calculator is **allowed**.

SECTION – I

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

(3×3=9)

a) Find the n^{th} derivative of $\frac{x^2}{2x^2 + 7x + 6}$.

b) Expand $\tan^{-1}x$ in powers of $(x - 1)$ upto the term containing fourth degree.

c) Evaluate $\lim_{x \rightarrow 0} \frac{x^2 + 2\cos x - 2}{x \sin^3 x}$.

d) Find the rank of the matrix by reducing to normal form $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 3 & 2 & 5 & 2 \\ 2 & -1 & 1 & -3 \end{bmatrix}$.

e) Examine whether the following vectors are linearly independent or dependent. If dependent, then find the relation between them. $[2, -1, 3, 2], [1, 3, 4, 2], [3, -5, 2, 2]$.

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

(3×3=9)

a) Prove that $\sin^{-1}\left(\frac{2x}{1+x^2}\right) = 2\left[x - \frac{x^3}{3} + \frac{x^5}{5} \dots\right]$.

b) Evaluate $\lim_{x \rightarrow 1} \left[\frac{x}{x-1} - \frac{1}{\log x} \right]$.

c) Find the values of λ and μ for which the system $x + y + z = 6$; $x + 2y + 3z = 10$;
 $x + 2y + \lambda z = \mu$ has :

- i) a unique solution
- ii) infinitely many solution
- iii) no solution.

d) Find the characteristic equation of the matrix and obtain A^{-1} where $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$.

e) Verify the Lagrange's mean value theorem for the function $f(x) = x(x - 1)(x - 2)$ in $(0, \frac{1}{2})$.



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

(2×5=10)

a) Find eigen values and corresponding eigen vector of the matrix A, where

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}.$$

b) If $y = e^{a \cos^{-1} x}$, prove that $(1 - x^2) y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$.

c) Expand $e^x \sin x$ in ascending powers of x upto x^4 .

SECTION – II

5. Solve **any three** :

(3×3=9)

a) If $u = x^2y + y^2z + z^2x$, prove that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \right)^2 u = 6(x + y + z)$.

b) If $u = f\left(\frac{x-y}{xy}, \frac{z-x}{zx}\right)$, prove that $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} + z^2 \frac{\partial u}{\partial z} = 0$.

c) If $u = 3x + 2y - z$, $v = x - 2y + z$, $w = x(x + 2y - z)$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$.

d) Divide 75 into three parts such that their product is maximum.

e) Find the rate of change of $\phi = xy + yz + zx$ at $(1, -1, 2)$ in the direction of the normal to the surface $x^2 + y^2 = z + 4$.

6. Solve **any three** :

(3×3=9)

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

b) 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 .

c) Find the possible percentage error in computing the parallel resistance r of three resistances r_1, r_2, r_3 from the formula $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$, if r_1, r_2, r_3 are each in error by 1%.

d) Find the angle between the surfaces $x^2 + y^2 + z^2 = 12$ and $x^2 + y^2 - z = 6$ at $(2, -2, 2)$.

e) A particle moves along the curve $x = e^{-t}$, $y = 2 \cos 2t$, $z = 2 \sin 3t$. Find the velocity and acceleration vectors and the magnitudes of velocity and acceleration at $t = 0$.

7. Solve **any two** :

(2×5=10)

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

b) Find the maxima and minima of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$.

c) Show that the vector $\vec{F} = (y^2 \cos x + z^3)\mathbf{i} + (2y \sin x - 4)\mathbf{j} + (3xz^2 + z)\mathbf{k}$ is irrotational and find its scalar potential.



- 6) If $\vec{r} = xi + yj + zk$, then $\text{curl } \vec{r} =$
- a) 3 b) $\frac{1}{3}$ c) 0 d) Does not exist
- 7) A vector function \vec{F} is called solenoidal if
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- 8) The n^{th} derivative of $\frac{1}{x}$ is _____
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- c) $y - \frac{y^3}{3!} + \frac{y^5}{5!} \dots$ d) $y + \frac{y^3}{3!} + \frac{y^5}{5!} + \dots$
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- 12) The rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is _____
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SECTION – I

2. Solve **any three** of the following : **(3×3=9)**

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(2×5=10)

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SECTION – II

5. Solve **any three** :

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e) A particle moves along the curve $x = e^{-t}$, $y = 2 \cos 2t$, $z = 2 \sin 3t$. Find the velocity and acceleration vectors and the magnitudes of velocity and acceleration at $t = 0$.

7. Solve **any two** :

(2×5=10)

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

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F.Y. B.Tech. (Semester – I) (CBCS) Examination, 2018
ENGINEERING MATHEMATICS – I (New)

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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) The rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is _____
a) 0 b) 1 c) 2 d) 3
- 2) The system $AX = B$, where A is square matrix, has a unique solution, if
a) $|A| = 0$ b) $|A| \neq 0$ c) $|A| = -|A|$ d) None of these
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a) 2, $\frac{1}{3}$, 4 b) $\frac{1}{2}$, 3, 4 c) 2, 3, $\frac{1}{4}$ d) $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$
- 4) If $f(x, y) = x^{\frac{1}{3}}y^{-\frac{2}{3}} + x^{\frac{2}{3}}y^{-\frac{1}{3}}$, then f is homogeneous of degree
a) $\frac{1}{3}$ b) 1 c) $\frac{2}{3}$ d) None of these
- 5) If $x = r \cos\theta$, $y = r \sin\theta$, then $\frac{\partial(x, y)}{\partial(r, \theta)} =$
a) 0 b) r c) $\frac{1}{r^2}$ d) r^2
- 6) If ∂x is the error in x , then $\frac{\partial x}{x}$ is called
a) positive error b) percentage error
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P.T.O.



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SECTION – I

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

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

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a) Find eigen values and corresponding eigen vector of the matrix A, where

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SECTION – II

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- N.B. :** 1) Figures to the **right** indicate **full** marks.
2) **Use** of calculator is **allowed**.
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) If ∂x is the error in x , then $\frac{\partial x}{x}$ is called
a) positive error
b) percentage error
c) relative error
d) none of these
- 2) The necessary conditions for $f(x, y) = 0$ to have extremum are
a) $f_{xy} = 0, f_{yx} = 0$
b) $f_{xx} = 0, f_{yy} = 0$
c) $f_x = 0, f_y = 0$
d) $f_x = 0, f_y = 0, f_{xx} > 0, f_{yy} > 0$
- 3) The unit tangent to the curve $x = t, y = t^2, z = t^3$ at point $(-1, 1, -1)$ is
a) $\frac{1}{\sqrt{14}}(i + 2j + 3k)$
b) $\frac{1}{\sqrt{14}}(i - 2j + 3k)$
c) $\frac{1}{\sqrt{3}}(i + j + k)$
d) $\frac{1}{\sqrt{3}}(i - j + k)$
- 4) If $\vec{r} = xi + yj + zk$, then $\text{curl } \vec{r} =$
a) 3
b) $\frac{1}{3}$
c) 0
d) Does not exist
- 5) A vector function \vec{F} is called solenoidal if
a) $\text{div } \vec{F} = 0$
b) $\text{curl } \vec{F} = 0$
c) $\text{grad } \vec{F} = 0$
d) $\nabla^2 \vec{F} = 0$



- 6) The n^{th} derivative of $\frac{1}{x}$ is _____
- a) $\frac{(-1)^n n!}{x^{n+1}}$ b) $\frac{(-1)^n n!}{x^n}$ c) $\frac{(-1)^n (n-1)!}{x^n}$ d) $\frac{(-1)^n (n-1)!}{x^{n+1}}$
- 7) If $y = \sin^{-1}x$, then $x =$ _____
- a) $1 + y + \frac{y^2}{2!} + \frac{y^3}{3!} + \dots$ b) $1 - y + \frac{y^2}{2!} - \frac{y^3}{3!} + \dots$
- c) $y - \frac{y^3}{3!} + \frac{y^5}{5!} \dots$ d) $y + \frac{y^3}{3!} + \frac{y^5}{5!} + \dots$
- 8) If $y = x \sin x$, then $y_n =$ _____
- a) $\sin\left(x + n\frac{\pi}{2}\right)$ b) $x \sin\left(x + \frac{n\pi}{2}\right)$
- c) $x \cos\left(x + n\frac{\pi}{2}\right) + n \cos\left(x + (n-1)\frac{\pi}{2}\right)$ d) $x \sin\left(x + n\frac{\pi}{2}\right) + n \sin\left(x + (n-1)\frac{\pi}{2}\right)$
- 9) The expansion of e^x in powers of $(x-1)$ is _____
- a) $1 + (x-1) + \frac{(x-1)^2}{2!} + \dots \infty$ b) $e\left[1 + (x-1) + \frac{(x-1)^2}{2!} + \dots \infty\right]$
- c) $e\left[1 - (x-1) + \frac{(x-1)^2}{2!} \dots \infty\right]$ d) None of these
- 10) The rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is _____
- a) 0 b) 1 c) 2 d) 3
- 11) The system $AX = B$, where A is square matrix, has a unique solution, if
- a) $|A| = 0$ b) $|A| \neq 0$ c) $|A| = -|A|$ d) None of these
- 12) If the eigen values of a matrix A are 2, 3, 4, then the eigen values of A^{-1} are
- a) 2, $\frac{1}{3}$, 4 b) $\frac{1}{2}$, 3, 4 c) 2, 3, $\frac{1}{4}$ d) $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$
- 13) If $f(x, y) = x^{\frac{1}{3}}y^{-\frac{2}{3}} + x^{\frac{2}{3}}y^{-\frac{1}{3}}$, then f is homogeneous of degree
- a) $\frac{1}{3}$ b) 1 c) $\frac{2}{3}$ d) None of these
- 14) If $x = r \cos\theta$, $y = r \sin\theta$, then $\frac{\partial(x, y)}{\partial(r, \theta)} =$
- a) 0 b) r c) $\frac{1}{r^2}$ d) r^2



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**F.Y. B.Tech. (Semester – I) (CBCS) Examination, 2018
ENGINEERING MATHEMATICS – I (New)**

Day and Date : Monday, 3-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

N.B. : 1) Figures to the **right** indicate **full** marks.
2) **Use** of calculator is **allowed**.

SECTION – I

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

(3×3=9)

a) Find the n^{th} derivative of $\frac{x^2}{2x^2 + 7x + 6}$.

b) Expand $\tan^{-1}x$ in powers of $(x - 1)$ upto the term containing fourth degree.

c) Evaluate $\lim_{x \rightarrow 0} \frac{x^2 + 2\cos x - 2}{x \sin^3 x}$.

d) Find the rank of the matrix by reducing to normal form $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 3 & 2 & 5 & 2 \\ 2 & -1 & 1 & -3 \end{bmatrix}$.

e) Examine whether the following vectors are linearly independent or dependent. If dependent, then find the relation between them. $[2, -1, 3, 2], [1, 3, 4, 2], [3, -5, 2, 2]$.

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

(3×3=9)

a) Prove that $\sin^{-1}\left(\frac{2x}{1+x^2}\right) = 2\left[x - \frac{x^3}{3} + \frac{x^5}{5} \dots\right]$.

b) Evaluate $\lim_{x \rightarrow 1} \left[\frac{x}{x-1} - \frac{1}{\log x} \right]$.

c) Find the values of λ and μ for which the system $x + y + z = 6$; $x + 2y + 3z = 10$;
 $x + 2y + \lambda z = \mu$ has :
i) a unique solution
ii) infinitely many solution
iii) no solution.

d) Find the characteristic equation of the matrix and obtain A^{-1} where $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$.

e) Verify the Lagrange's mean value theorem for the function $f(x) = x(x - 1)(x - 2)$ in $(0, \frac{1}{2})$.

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

(2×5=10)

a) Find eigen values and corresponding eigen vector of the matrix A, where

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}.$$

b) If $y = e^{a \cos^{-1} x}$, prove that $(1 - x^2) y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$.

c) Expand $e^x \sin x$ in ascending powers of x upto x^4 .

SECTION – II

5. Solve **any three** :

(3×3=9)

a) If $u = x^2y + y^2z + z^2x$, prove that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = 6(x + y + z)$.

b) If $u = f\left(\frac{x-y}{xy}, \frac{z-x}{zx}\right)$, prove that $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} + z^2 \frac{\partial u}{\partial z} = 0$.

c) If $u = 3x + 2y - z$, $v = x - 2y + z$, $w = x(x + 2y - z)$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$.

d) Divide 75 into three parts such that their product is maximum.

e) Find the rate of change of $\phi = xy + yz + zx$ at $(1, -1, 2)$ in the direction of the normal to the surface $x^2 + y^2 = z + 4$.

6. Solve **any three** :

(3×3=9)

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

b) 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 .

c) Find the possible percentage error in computing the parallel resistance r of three resistances r_1, r_2, r_3 from the formula $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$, if r_1, r_2, r_3 are each in error by 1%.

d) Find the angle between the surfaces $x^2 + y^2 + z^2 = 12$ and $x^2 + y^2 - z = 6$ at $(2, -2, 2)$.

e) A particle moves along the curve $x = e^{-t}$, $y = 2 \cos 2t$, $z = 2 \sin 3t$. Find the velocity and acceleration vectors and the magnitudes of velocity and acceleration at $t = 0$.

7. Solve **any two** :

(2×5=10)

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

b) Find the maxima and minima of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$.

c) Show that the vector $\vec{F} = (y^2 \cos x + z^3)\mathbf{i} + (2y \sin x - 4)\mathbf{j} + (3xz^2 + z)\mathbf{k}$ is irrotational and find its scalar potential.



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F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS

Day and Date : Wednesday, 5-12-2018
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) **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.**
 - 4) **Figures to the right indicate full marks.**
 - 5) **Assume suitable data if found necessary and mention it clearly.**
 - 6) **Use of nonprogrammable calculator is allowed.**

1. Choose the correct alternatives.

14

- 1) Resultant of two equal forces is equal to either of them, the angle between the forces is
 - a) 0°
 - b) 60°
 - c) 90°
 - d) 120°
- 2) The resultant of two parallel forces of magnitude P in same direction will be
 - a) P
 - b) 2P
 - c) $\sqrt{2}P$
 - d) Zero
- 3) If a body is in equilibrium under the action of only three forces, they can be _____ forces.
 - a) concurrent
 - b) non concurrent
 - c) unlike parallel
 - d) all of these
- 4) The process of finding the components is called
 - a) Composition
 - b) Resolution
 - c) Idealization
 - d) Summation
- 5) The algebraic sum of the two forces forming couple is always equal to
 - a) Magnitude of the one force
 - b) Zero
 - c) Negative value
 - d) Positive value



**F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS**

Day and Date : Wednesday, 5-12-2018
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) **Assume suitable data if found necessary and mention it clearly.**
 - 4) **Use of nonprogrammable calculator is allowed.**

2. Solve **any four**. (3×4=12)

- a) State and explain principle of transmissibility.
- b) State and prove Lami's theorem.
- c) Explain system of forces.
- d) State and prove parallel axis theorem.
- e) Explain types of beam with neat sketches.
- f) Define angle of friction, angle of repose and cone of friction.

3. Solve **any two** : (2×8=16)

- 1) A wire is fixed at A and D as shown in Fig. 1. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical.

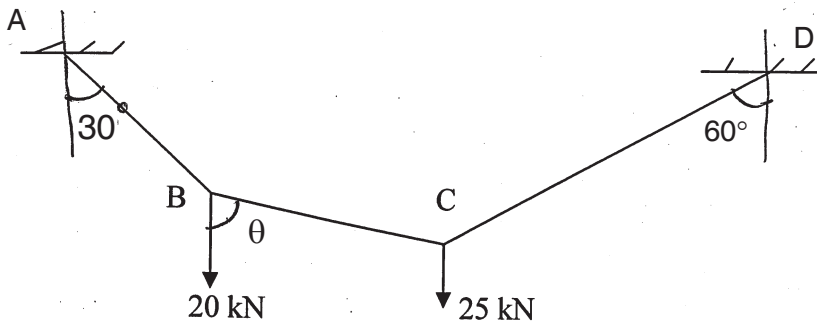


Fig. 1

- 2) Determine the forces in all the members of the truss as shown in Fig. 2 and indicate the magnitude and nature of forces on force diagram.

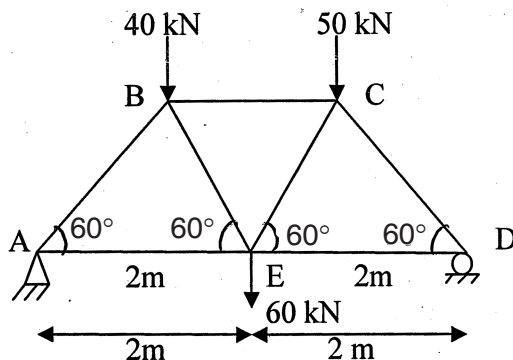
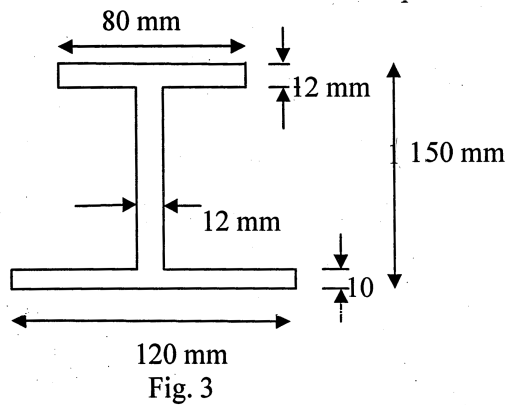


Fig. 2



- 3) Determine the polar moment of inertia about the centroidal axes of the I-section as shown in Fig. 3. Also determine the radii of gyration with respect to XX and YY axes.



4. Solve **any four**.

(3×4=12)

- Prove any two equations of rotary motion.
- State work-energy principle and its application.
- Obtain equations for horizontal range and maximum height reached by a projectile.
- Explain use of any two motion curves with neat sketches.
- State types of mechanical vibrations. Explain the term degree freedom.
- The rotation of fly wheel is governed by the equation $\omega = 3t^2 - 2t + 2$. After one second from the start the angular displacement was 4 radians. Determine the angular displacement and angular velocity of the fly wheel $t = 3$ seconds.

5. Solve **any two**.

(2×8=16)

- A bullet is fired from a height of 120 m at a velocity of 360 kmph at an angle of 30° upwards. Neglecting air resistance, find
 - Total time of flight
 - Horizontal range of the bullet
 - Maximum height reached by the bullet.



- 2) Two blocks A and B weighing 200 N and 800 N are connected by a cable and they move along rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in fig. 4. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Use D' Alembert's principle and determine the acceleration of the weight and tension in the cable.

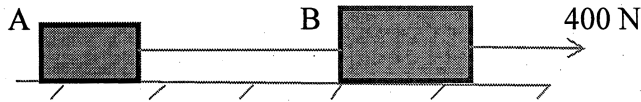


Fig.4

- 3) A small block starts from rest at point A and slides down the inclined plane as shown in fig. 5. What distance along the horizontal plane will it travel before coming to rest ? The coefficient of kinetic friction between the block of either plane is 0.3. Assume that the initial velocity with which it starts to move along BC is of the same magnitude as that gained in sliding from A to B.

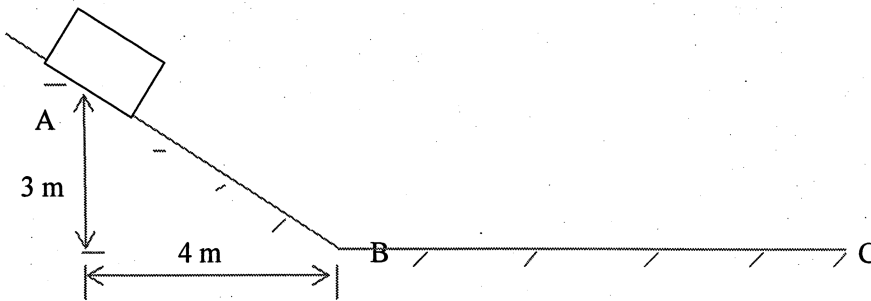


Fig.5



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**F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS**

Day and Date : Wednesday, 5-12-2018
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) **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.**
 - 4) **Figures to the right indicate full marks.**
 - 5) **Assume suitable data if found necessary and mention it clearly.**
 - 6) **Use of nonprogrammable calculator is allowed.**

1. Choose the correct alternatives.

14

- 1) A lift is moving upwards with an acceleration 'g'. The pressure exerted by man on the floor of the lift is
 - a) Equal to his weight
 - b) Zero
 - c) Double than his weight
 - d) None of the above
- 2) A ball is projected downward from 'A' with an initial velocity $V_a = 2$ m/s. If it takes 1 sec to strike the ground, determine height h.
 - a) 2.9 m
 - b) 4.9 m
 - c) 6.9 m
 - d) 9.81 m
- 3) In projectile motion, which of the following remains constant ?
 - a) Speed
 - b) Vertical component of velocity
 - c) Horizontal component of Velocity
 - d) None of the above
- 4) A body of mass 2 kg is dropped from a height of 10m. What is its velocity when it strikes the ground surface ?
 - a) 14m/s
 - b) 9.81 m/s
 - c) 10 m/s
 - d) 5 m/s
- 5) Large force acting on a particle during a short interval of time is known as
 - a) Impact
 - b) Mega force
 - c) Impulsive force
 - d) Nano force



- 6) Product of mass and velocity is
a) Power b) Moment c) Movement d) Momentum
- 7) D' Alembert's equation is application of Newton's _____ law of motion.
a) first b) second
c) third d) none of these
- 8) Resultant of two equal forces is equal to either of them, the angle between the forces is
a) 0° b) 60° c) 90° d) 120°
- 9) The resultant of two parallel forces of magnitude P in same direction will be
a) P b) 2P c) $\sqrt{2}P$ d) Zero
- 10) If a body is in equilibrium under the action of only three forces, they can be _____ forces.
a) concurrent b) non concurrent
c) unlike parallel d) all of these
- 11) The process of finding the components is called
a) Composition b) Resolution c) Idealization d) Summation
- 12) The algebraic sum of the two forces forming couple is always equal to
a) Magnitude of the one force b) Zero
c) Negative value d) Positive value
- 13) If the arm of a couple is made half, its moment will
a) be half b) remains the same
c) be doubled d) none of the above
- 14) If a body is in equilibrium, resultant acting on it is
a) minimum b) maximum c) zero d) negative
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**F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS**

Day and Date : Wednesday, 5-12-2018
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) **Assume suitable data if found necessary and mention it clearly.**
 - 4) **Use of nonprogrammable calculator is allowed.**

2. Solve **any four**. (3×4=12)

- a) State and explain principle of transmissibility.
- b) State and prove Lami's theorem.
- c) Explain system of forces.
- d) State and prove parallel axis theorem.
- e) Explain types of beam with neat sketches.
- f) Define angle of friction, angle of repose and cone of friction.

3. Solve **any two** : (2×8=16)

- 1) A wire is fixed at A and D as shown in Fig. 1. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical.

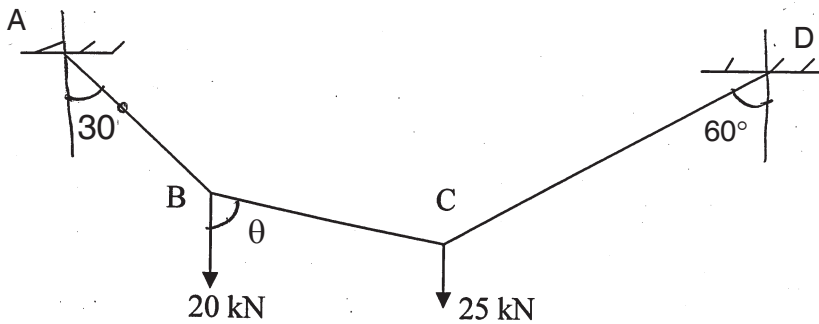


Fig. 1

- 2) Determine the forces in all the members of the truss as shown in Fig. 2 and indicate the magnitude and nature of forces on force diagram.

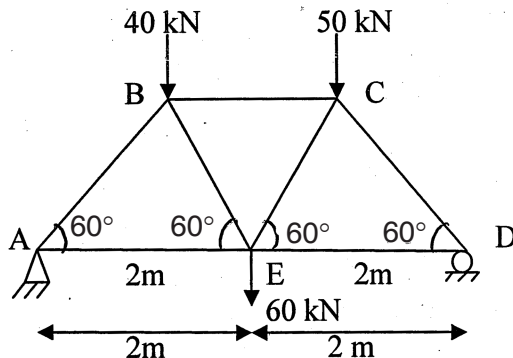
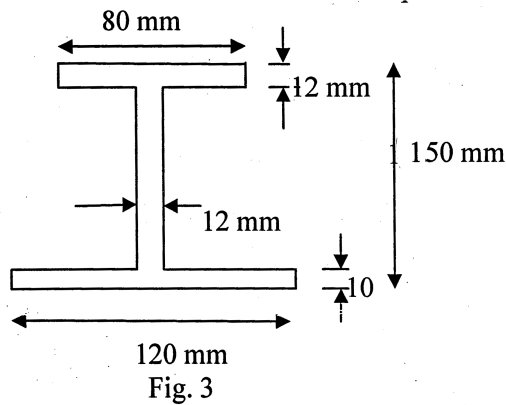


Fig. 2



- 3) Determine the polar moment of inertia about the centroidal axes of the I-section as shown in Fig. 3. Also determine the radii of gyration with respect to XX and YY axes.



4. Solve **any four**.

(3×4=12)

- Prove any two equations of rotary motion.
- State work-energy principle and its application.
- Obtain equations for horizontal range and maximum height reached by a projectile.
- Explain use of any two motion curves with neat sketches.
- State types of mechanical vibrations. Explain the term degree freedom.
- The rotation of fly wheel is governed by the equation $\omega = 3t^2 - 2t + 2$. After one second from the start the angular displacement was 4 radians. Determine the angular displacement and angular velocity of the fly wheel $t = 3$ seconds.

5. Solve **any two**.

(2×8=16)

- A bullet is fired from a height of 120 m at a velocity of 360 kmph at an angle of 30° upwards. Neglecting air resistance, find
 - Total time of flight
 - Horizontal range of the bullet
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- 2) Two blocks A and B weighing 200 N and 800 N are connected by a cable and they move along rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in fig. 4. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Use D' Alembert's principle and determine the acceleration of the weight and tension in the cable.

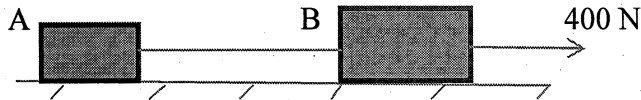


Fig.4

- 3) A small block starts from rest at point A and slides down the inclined plane as shown in fig. 5. What distance along the horizontal plane will it travel before coming to rest ? The coefficient of kinetic friction between the block of either plane is 0.3. Assume that the initial velocity with which it starts to move along BC is of the same magnitude as that gained in sliding from A to B.

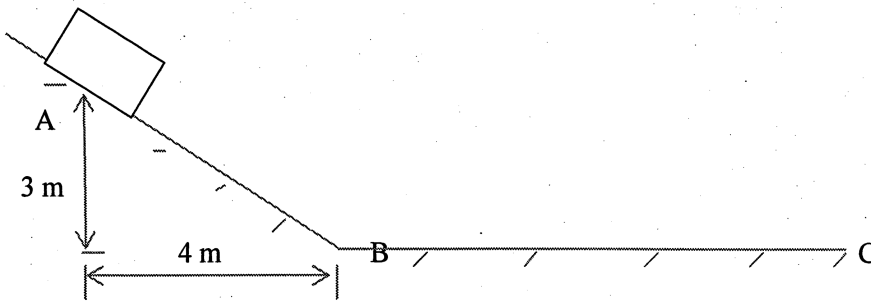


Fig.5



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F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS

Day and Date : Wednesday, 5-12-2018
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.**
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 - 5) **Assume suitable data if found necessary and mention it clearly.**
 - 6) **Use of nonprogrammable calculator is allowed.**

1. Choose the correct alternatives.

14

- 1) The algebraic sum of the two forces forming couple is always equal to
 - a) Magnitude of the one force
 - b) Zero
 - c) Negative value
 - d) Positive value
- 2) If the arm of a couple is made half, its moment will
 - a) be half
 - b) remains the same
 - c) be doubled
 - d) none of the above
- 3) If a body is in equilibrium, resultant acting on it is
 - a) minimum
 - b) maximum
 - c) zero
 - d) negative
- 4) A lift is moving upwards with an acceleration 'g'. The pressure exerted by man on the floor of the lift is
 - a) Equal to his weight
 - b) Zero
 - c) Double than his weight
 - d) None of the above
- 5) A ball is projected downward from 'A' with an initial velocity $V_a = 2$ m/s. If it takes 1 sec to strike the ground, determine height h.
 - a) 2.9 m
 - b) 4.9 m
 - c) 6.9 m
 - d) 9.81 m



**F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS**

Day and Date : Wednesday, 5-12-2018
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) **Assume suitable data if found necessary and mention it clearly.**
 - 4) **Use of nonprogrammable calculator is allowed.**

2. Solve **any four**. (3×4=12)

- a) State and explain principle of transmissibility.
- b) State and prove Lami's theorem.
- c) Explain system of forces.
- d) State and prove parallel axis theorem.
- e) Explain types of beam with neat sketches.
- f) Define angle of friction, angle of repose and cone of friction.

3. Solve **any two** : (2×8=16)

- 1) A wire is fixed at A and D as shown in Fig. 1. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical.

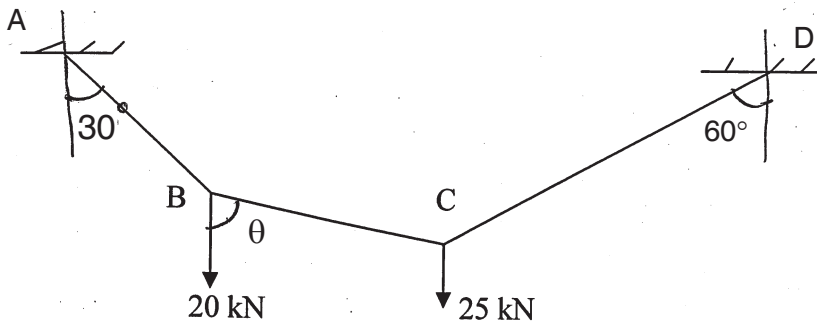


Fig. 1

- 2) Determine the forces in all the members of the truss as shown in Fig. 2 and indicate the magnitude and nature of forces on force diagram.

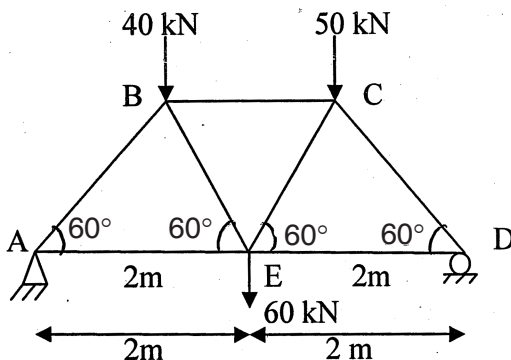
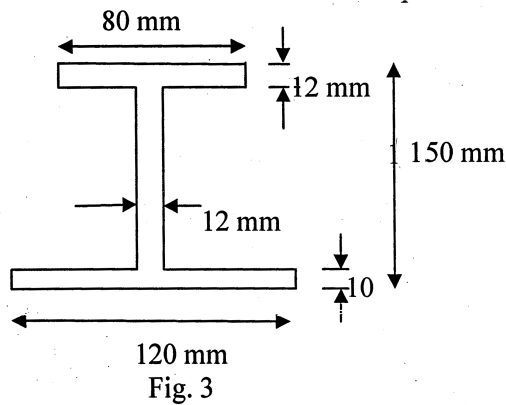


Fig. 2



- 3) Determine the polar moment of inertia about the centroidal axes of the I-section as shown in Fig. 3. Also determine the radii of gyration with respect to XX and YY axes.



4. Solve **any four**.

(3×4=12)

- Prove any two equations of rotary motion.
- State work-energy principle and its application.
- Obtain equations for horizontal range and maximum height reached by a projectile.
- Explain use of any two motion curves with neat sketches.
- State types of mechanical vibrations. Explain the term degree freedom.
- The rotation of fly wheel is governed by the equation $\omega = 3t^2 - 2t + 2$. After one second from the start the angular displacement was 4 radians. Determine the angular displacement and angular velocity of the fly wheel $t = 3$ seconds.

5. Solve **any two**.

(2×8=16)

- A bullet is fired from a height of 120 m at a velocity of 360 kmph at an angle of 30° upwards. Neglecting air resistance, find
 - Total time of flight
 - Horizontal range of the bullet
 - Maximum height reached by the bullet.



- 2) Two blocks A and B weighing 200 N and 800 N are connected by a cable and they move along rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in fig. 4. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Use D' Alembert's principle and determine the acceleration of the weight and tension in the cable.

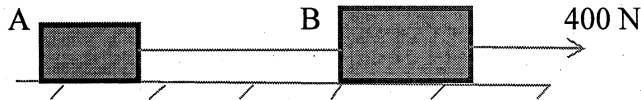


Fig.4

- 3) A small block starts from rest at point A and slides down the inclined plane as shown in fig. 5. What distance along the horizontal plane will it travel before coming to rest ? The coefficient of kinetic friction between the block of either plane is 0.3. Assume that the initial velocity with which it starts to move along BC is of the same magnitude as that gained in sliding from A to B.

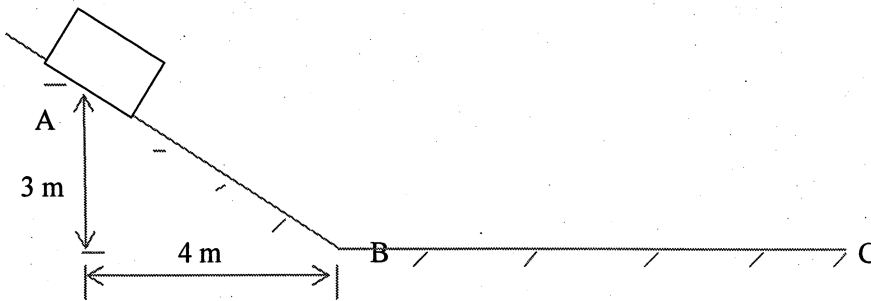


Fig.5



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F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS

Day and Date : Wednesday, 5-12-2018
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) **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.**
 - 4) **Figures to the right indicate full marks.**
 - 5) **Assume suitable data if found necessary and mention it clearly.**
 - 6) **Use of nonprogrammable calculator is allowed.**

1. Choose the correct alternatives.

14

- 1) In projectile motion, which of the following remains constant ?
a) Speed
b) Vertical component of velocity
c) Horizontal component of Velocity
d) None of the above
- 2) A body of mass 2 kg is dropped from a height of 10m. What is its velocity when it strikes the ground surface ?
a) 14m/s
b) 9.81 m/s
c) 10 m/s
d) 5 m/s
- 3) Large force acting on a particle during a short interval of time is known as
a) Impact
b) Mega force
c) Impulsive force
d) Nano force
- 4) Product of mass and velocity is
a) Power
b) Moment
c) Movement
d) Momentum
- 5) D' Alembert's equation is application of Newton's _____ law of motion.
a) first
b) second
c) third
d) none of these



- 6) Resultant of two equal forces is equal to either of them, the angle between the forces is
- a) 0° b) 60° c) 90° d) 120°
- 7) The resultant of two parallel forces of magnitude P in same direction will be
- a) P b) 2P c) $\sqrt{2}P$ d) Zero
- 8) If a body is in equilibrium under the action of only three forces, they can be _____ forces.
- a) concurrent b) non concurrent
c) unlike parallel d) all of these
- 9) The process of finding the components is called
- a) Composition b) Resolution c) Idealization d) Summation
- 10) The algebraic sum of the two forces forming couple is always equal to
- a) Magnitude of the one force b) Zero
c) Negative value d) Positive value
- 11) If the arm of a couple is made half, its moment will
- a) be half b) remains the same
c) be doubled d) none of the above
- 12) If a body is in equilibrium, resultant acting on it is
- a) minimum b) maximum c) zero d) negative
- 13) A lift is moving upwards with an acceleration 'g'. The pressure exerted by man on the floor of the lift is
- a) Equal to his weight b) Zero
c) Double than his weight d) None of the above
- 14) A ball is projected downward from 'A' with an initial velocity $V_a = 2$ m/s. If it takes 1 sec to strike the ground, determine height h.
- a) 2.9 m b) 4.9 m c) 6.9 m d) 9.81 m



**F.Y. (B.Tech.) (Semester – I) (New CBCS) Examination, 2018
ENGINEERING MECHANICS**

Day and Date : Wednesday, 5-12-2018
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) **Assume suitable data if found necessary and mention it clearly.**
 - 4) **Use of nonprogrammable calculator is allowed.**

2. Solve **any four**. (3×4=12)

- a) State and explain principle of transmissibility.
- b) State and prove Lami's theorem.
- c) Explain system of forces.
- d) State and prove parallel axis theorem.
- e) Explain types of beam with neat sketches.
- f) Define angle of friction, angle of repose and cone of friction.

3. Solve **any two** : (2×8=16)

- 1) A wire is fixed at A and D as shown in Fig. 1. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical.

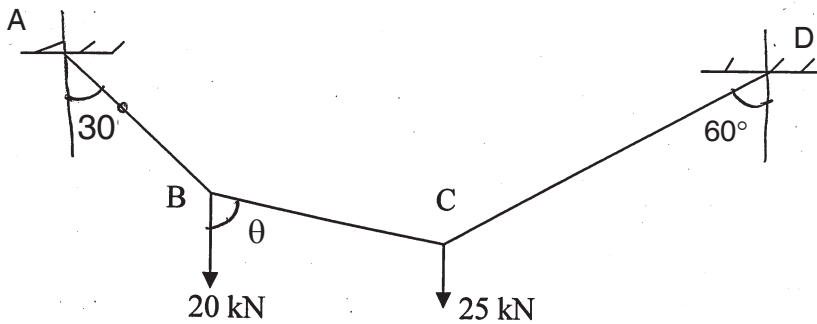


Fig. 1

- 2) Determine the forces in all the members of the truss as shown in Fig. 2 and indicate the magnitude and nature of forces on force diagram.

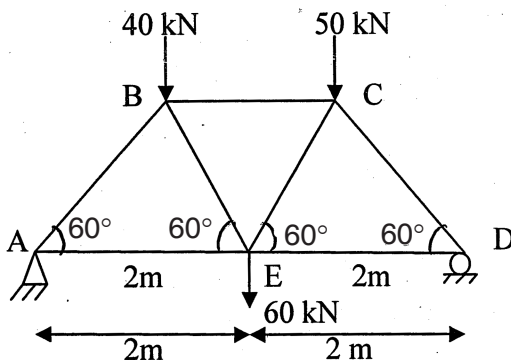
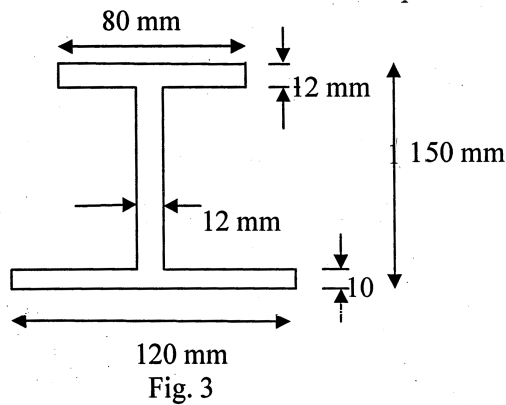


Fig. 2



- 3) Determine the polar moment of inertia about the centroidal axes of the I-section as shown in Fig. 3. Also determine the radii of gyration with respect to XX and YY axes.



4. Solve **any four**.

(3×4=12)

- Prove any two equations of rotary motion.
- State work-energy principle and its application.
- Obtain equations for horizontal range and maximum height reached by a projectile.
- Explain use of any two motion curves with neat sketches.
- State types of mechanical vibrations. Explain the term degree freedom.
- The rotation of fly wheel is governed by the equation $\omega = 3t^2 - 2t + 2$. After one second from the start the angular displacement was 4 radians. Determine the angular displacement and angular velocity of the fly wheel $t = 3$ seconds.

5. Solve **any two**.

(2×8=16)

- A bullet is fired from a height of 120 m at a velocity of 360 kmph at an angle of 30° upwards. Neglecting air resistance, find
 - Total time of flight
 - Horizontal range of the bullet
 - Maximum height reached by the bullet.



- 2) Two blocks A and B weighing 200 N and 800 N are connected by a cable and they move along rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in fig. 4. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Use D' Alembert's principle and determine the acceleration of the weight and tension in the cable.

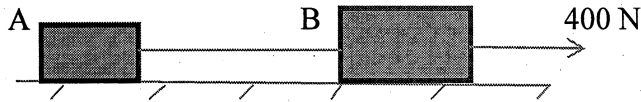


Fig.4

- 3) A small block starts from rest at point A and slides down the inclined plane as shown in fig. 5. What distance along the horizontal plane will it travel before coming to rest ? The coefficient of kinetic friction between the block of either plane is 0.3. Assume that the initial velocity with which it starts to move along BC is of the same magnitude as that gained in sliding from A to B.

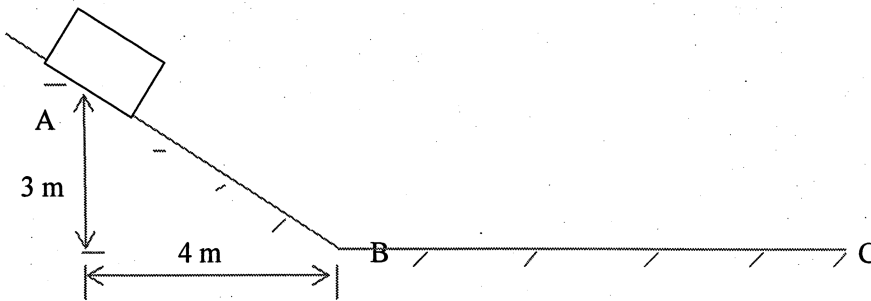


Fig.5



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P

F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Day and Date : Friday, 7-12-2018
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The impedance of purely inductive circuit is given by
a) $Z = R - jX_L$ b) $Z = -j X_L$ c) $Z = -j X_C$ d) $Z = j X_L$
- 2) For a balanced three phase system the total apparent power consumed is given by
a) $V_{ph} I_{ph} \cos\theta$ b) $V_{ph} I_{ph} \sin\theta$ c) $3V_{ph} I_{ph}$ d) $3V_L I_L$
- 3) The A transformer having 100 primary turns is connected to a 250 V a.c. supply for a secondary voltage of 400 V, the number of secondary turns should be
a) 1600 b) 250 c) 400 d) 1250
- 4) The _____ through all the parts of the series magnetic circuit is same.
a) flux b) reluctance c) mmf d) current
- 5) 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
- 6) Three identical resistances connected in star consume 400 W. If these three resistances are connected in delta across the same supply, the power consumed will
a) 4000 W b) 6000 W c) 8000 W d) 12000 W
- 7) In series R-C circuit, supply voltages is 50 V and voltage across resistor is 30 V voltage across capacitor is
a) 40 V b) 80 V
c) 20 V d) None of the above

P.T.O.



- 8) $(1110)_2 - (1101)_2 =$
a) 1101 b) 0110 c) 0001 d) 1000
- 9) In bridge rectifier, if input voltage is V_{ms} inwt then PIV across any diode will be
a) $2V_m$ b) V_m c) $\frac{V_m}{\sqrt{2}}$ d) $\frac{V_m}{2}$
- 10) Zener diode can be used as
a) Regulator b) Filter c) Amplifier d) Oscillator
- 11) Material used for LED is
a) GaAs b) CdSe
c) PbS d) None of the above
- 12) The ratio of collector current to base current is
a) α b) β c) γ d) θ
- 13) A transistor connected in common base configuration has
a) High input and low output resistance
b) Low input and low output resistance
c) High input and high output resistance
d) Low input and high output resistance
- 14) LVDT consists of _____ secondary and _____ primary winding.
a) One, one b) Two, two c) Two, one d) One, two
-



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**F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

Day and Date : Friday, 7-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

SECTION – I

2. Solve **any four** : **(4×4=16)**
- a) Define and derive expression for RMS value of sinusoidal alternating quantity.
 - b) State and explain Kirchhoff's laws with sign conventions and enlist its applications.
 - c) An iron ring of mean length 50 cms has an air gap of 1 mm and a winding of 200 turns. If the permeability of iron is 300 when a current of 1 A flows through the coil, find the flux density.
 - d) Discuss about mutually induced emf. And give one example of electrical device and explain its working principle.
 - e) Derive the formula for delta connected resistance using star connection.
 - f) A sinusoidal alternating voltage has an r.m.s. value of 200 V and a frequency of 50 Hz. It crosses the zero axis in a positive direction when $t = 0$. Determine the time when voltage first reaches the instantaneous value of 200V.
3. Solve **any two** : **(2×6=12)**
- a) Compare electric and magnetic circuit with their similarities and dissimilarities.
 - b) Derive relation between line and phase voltages and currents in balanced star connected 3 phase load.
 - c) The voltage applied to a circuit is $v = 100 \sin (\omega t + 30^\circ)$ and the current flowing in the circuit is $i = 15 \sin (\omega t + 60^\circ)$. Determine the impedance, resistance, reactance, power and the power factor of the circuit. Also draw phasor diagram.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Explain working of Bipolar junction transistor as an amplifier.
 - b) For bridge rectifier derive for :
 - i) Ripple factor
 - ii) Efficiency.
 - c) Perform subtraction using 2' complement :
 - i) $(275)_8 - (155)_8$.
 - d) State and prove the Demorgan's theorem.
 - e) Explain capacitor filter with center tap rectifier.
 - f) Explain construction and working of LVDT.
5. Solve **any two** : **(2×6=12)**
- a) Explain construction and operation of light emitting diode. Write applications of it and explain any one in detail.
 - b) Explain unbonded and bonded strain gauge with neat diagram.
 - c) Prove that :
 - i) $(A + \bar{B} + AB)(A + \bar{B})(\bar{A}B) = 0$
 - ii) $\bar{A}\bar{C} + B\bar{C} + ABC + \bar{A}BC = \bar{A}\bar{C} + B$.
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Q

**F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

Day and Date : Friday, 7-12-2018
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) $(1110)_2 - (1101)_2 =$
a) 1101 b) 0110 c) 0001 d) 1000
- 2) In bridge rectifier, if input voltage is V_{ms} inwvt then PIV across any diode will be
a) $2V_m$ b) V_m c) $\frac{V_m}{\sqrt{2}}$ d) $\frac{V_m}{2}$
- 3) Zener diode can be used as
a) Regulator b) Filter c) Amplifier d) Oscillator
- 4) Material used for LED is
a) GaAs b) CdSe
c) PbS d) None of the above
- 5) The ratio of collector current to base current is
a) α b) β c) γ d) θ
- 6) A transistor connected in common base configuration has
a) High input and low output resistance
b) Low input and low output resistance
c) High input and high output resistance
d) Low input and high output resistance
- 7) LVDT consists of _____ secondary and _____ primary winding.
a) One, one b) Two, two c) Two, one d) One, two
- 8) The impedance of purely inductive circuit is given by
a) $Z = R - jX_L$ b) $Z = -jX_L$ c) $Z = -jX_C$ d) $Z = jX_L$



- 9) For a balanced three phase system the total apperent power consumed is given by
a) $V_{ph} I_{ph} \cos\theta$ b) $V_{ph} I_{ph} \sin\theta$ c) $3V_{ph} I_{ph}$ d) $3V_L I_L$
- 10) The A transformer having 100 primary turns is connected to a 250 V a.c. supply for a secondary voltage of 400 V, the number of secondary turns should be
a) 1600 b) 250 c) 400 d) 1250
- 11) The _____ through all the parts of the series magnetic circuit is same.
a) flux b) reluctance c) mmf d) current
- 12) 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
- 13) Three identical resistances connected in star consume 400 W. If these three resistances are connected in delta across the same supply, the power consumed will
a) 4000 W b) 6000 W c) 8000 W d) 12000 W
- 14) In series R-C circuit, supply voltages is 50 V and voltage across resistor is 30 V voltage across capacitor is
a) 40 V b) 80 V
c) 20 V d) None of the abvoe
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**F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

Day and Date : Friday, 7-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) Define and derive expression for RMS value of sinusoidal alternating quantity.
- b) State and explain Kirchhoff's laws with sign conventions and enlist its applications.
- c) An iron ring of mean length 50 cms has an air gap of 1 mm and a winding of 200 turns. If the permeability of iron is 300 when a current of 1 A flows through the coil, find the flux density.
- d) Discuss about mutually induced emf. And give one example of electrical device and explain its working principle.
- e) Derive the formula for delta connected resistance using star connection.
- f) A sinusoidal alternating voltage has an r.m.s. value of 200 V and a frequency of 50 Hz. It crosses the zero axis in a positive direction when $t = 0$. Determine the time when voltage first reaches the instantaneous value of 200V.

3. Solve **any two** : **(2×6=12)**

- a) Compare electric and magnetic circuit with their similarities and dissimilarities.
- b) Derive relation between line and phase voltages and currents in balanced star connected 3 phase load.
- c) The voltage applied to a circuit is $v = 100 \sin (\omega t + 30^\circ)$ and the current flowing in the circuit is $i = 15 \sin (\omega t + 60^\circ)$. Determine the impedance, resistance, reactance, power and the power factor of the circuit. Also draw phasor diagram.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Explain working of Bipolar junction transistor as an amplifier.
 - b) For bridge rectifier derive for :
 - i) Ripple factor
 - ii) Efficiency.
 - c) Perform subtraction using 2' complement :
 - i) $(275)_8 - (155)_8$.
 - d) State and prove the Demorgan's theorem.
 - e) Explain capacitor filter with center tap rectifier.
 - f) Explain construction and working of LVDT.
5. Solve **any two** : **(2×6=12)**
- a) Explain construction and operation of light emitting diode. Write applications of it and explain any one in detail.
 - b) Explain unbonded and bonded strain gauge with neat diagram.
 - c) Prove that :
 - i) $(A + \bar{B} + AB)(A + \bar{B})(\bar{A}B) = 0$
 - ii) $\bar{A}\bar{C} + B\bar{C} + ABC + \bar{A}BC = \bar{A}\bar{C} + B$.
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Set **R**

F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Day and Date : Friday, 7-12-2018
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) 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
- 2) Three identical resistances connected in star consume 400 W. If these three resistances are connected in delta across the same supply, the power consumed will
 - a) 4000 W
 - b) 6000 W
 - c) 8000 W
 - d) 12000 W
- 3) In series R-C circuit, supply voltages is 50 V and voltage across resistor is 30 V voltage across capacitor is
 - a) 40 V
 - b) 80 V
 - c) 20 V
 - d) None of the above
- 4) $(1110)_2 - (1101)_2 =$
 - a) 1101
 - b) 0110
 - c) 0001
 - d) 1000
- 5) In bridge rectifier, if input voltage is V_{ms} inwt then PIV across any diode will be
 - a) $2V_m$
 - b) V_m
 - c) $\frac{V_m}{\sqrt{2}}$
 - d) $\frac{V_m}{2}$
- 6) Zener diode can be used as
 - a) Regulator
 - b) Filter
 - c) Amplifier
 - d) Oscillator
- 7) Material used for LED is
 - a) GaAs
 - b) CdSe
 - c) PbS
 - d) None of the above
- 8) The ratio of collector current to base current is
 - a) α
 - b) β
 - c) γ
 - d) θ

P.T.O.



- 9) A transistor connected in common base configuration has
- a) High input and low output resistance
 - b) Low input and low output resistance
 - c) High input and high output resistance
 - d) Low input and high output resistance
- 10) LVDT consists of _____ secondary and _____ primary winding.
- a) One, one
 - b) Two, two
 - c) Two, one
 - d) One, two
- 11) The impedance of purely inductive circuit is given by
- a) $Z = R - jX_L$
 - b) $Z = -j X_L$
 - c) $Z = -j X_C$
 - d) $Z = j X_L$
- 12) For a balanced three phase system the total apperent power consumed is given by
- a) $V_{ph} I_{ph} \cos\theta$
 - b) $V_{ph} I_{ph} \sin\theta$
 - c) $3V_{ph} I_{ph}$
 - d) $3V_L I_L$
- 13) The A transformer having 100 primary turns is connected to a 250 V a.c. supply for a secondary voltage of 400 V, the number of secondary turns should be
- a) 1600
 - b) 250
 - c) 400
 - d) 1250
- 14) The _____ through all the parts of the series magnetic circuit is same.
- a) flux
 - b) reluctance
 - c) mmf
 - d) current
-



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**F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

Day and Date : Friday, 7-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) Define and derive expression for RMS value of sinusoidal alternating quantity.
- b) State and explain Kirchhoff's laws with sign conventions and enlist its applications.
- c) An iron ring of mean length 50 cms has an air gap of 1 mm and a winding of 200 turns. If the permeability of iron is 300 when a current of 1 A flows through the coil, find the flux density.
- d) Discuss about mutually induced emf. And give one example of electrical device and explain its working principle.
- e) Derive the formula for delta connected resistance using star connection.
- f) A sinusoidal alternating voltage has an r.m.s. value of 200 V and a frequency of 50 Hz. It crosses the zero axis in a positive direction when $t = 0$. Determine the time when voltage first reaches the instantaneous value of 200V.

3. Solve **any two** : **(2×6=12)**

- a) Compare electric and magnetic circuit with their similarities and dissimilarities.
- b) Derive relation between line and phase voltages and currents in balanced star connected 3 phase load.
- c) The voltage applied to a circuit is $v = 100 \sin (\omega t + 30^\circ)$ and the current flowing in the circuit is $i = 15 \sin (\omega t + 60^\circ)$. Determine the impedance, resistance, reactance, power and the power factor of the circuit. Also draw phasor diagram.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Explain working of Bipolar junction transistor as an amplifier.
 - b) For bridge rectifier derive for :
 - i) Ripple factor
 - ii) Efficiency.
 - c) Perform subtraction using 2' complement :
 - i) $(275)_8 - (155)_8$.
 - d) State and prove the Demorgan's theorem.
 - e) Explain capacitor filter with center tap rectifier.
 - f) Explain construction and working of LVDT.
5. Solve **any two** : **(2×6=12)**
- a) Explain construction and operation of light emitting diode. Write applications of it and explain any one in detail.
 - b) Explain unbonded and bonded strain gauge with neat diagram.
 - c) Prove that :
 - i) $(A + \bar{B} + AB)(A + \bar{B})(\bar{A}B) = 0$
 - ii) $\bar{A}\bar{C} + B\bar{C} + ABC + \bar{A}BC = \bar{A}\bar{C} + B$.
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F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Day and Date : Friday, 7-12-2018
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.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Zener diode can be used as
 - a) Regulator
 - b) Filter
 - c) Amplifier
 - d) Oscillator
- 2) Material used for LED is
 - a) GaAs
 - b) CdSe
 - c) PbS
 - d) None of the above
- 3) The ratio of collector current to base current is
 - a) α
 - b) β
 - c) γ
 - d) θ
- 4) A transistor connected in common base configuration has
 - a) High input and low output resistance
 - b) Low input and low output resistance
 - c) High input and high output resistance
 - d) Low input and high output resistance
- 5) LVDT consists of _____ secondary and _____ primary winding.
 - a) One, one
 - b) Two, two
 - c) Two, one
 - d) One, two
- 6) The impedance of purely inductive circuit is given by
 - a) $Z = R - jX_L$
 - b) $Z = -jX_L$
 - c) $Z = -jX_C$
 - d) $Z = jX_L$
- 7) For a balanced three phase system the total apperent power consumed is given by
 - a) $V_{ph} I_{ph} \cos\theta$
 - b) $V_{ph} I_{ph} \sin\theta$
 - c) $3V_{ph} I_{ph}$
 - d) $3V_L I_L$
- 8) The A transformer having 100 primary turns is connected to a 250 V a.c. supply for a secondary voltage of 400 V, the number of secondary turns should be
 - a) 1600
 - b) 250
 - c) 400
 - d) 1250

P.T.O.



- 9) The _____ through all the parts of the series magnetic circuit is same.
a) flux b) reluctance c) mmf d) current
- 10) 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
- 11) Three identical resistances connected in star consume 400 W. If these three resistances are connected in delta across the same supply, the power consumed will
a) 4000 W b) 6000 W c) 8000 W d) 12000 W
- 12) In series R-C circuit, supply voltage is 50 V and voltage across resistor is 30 V voltage across capacitor is
a) 40 V b) 80 V
c) 20 V d) None of the above
- 13) $(1110)_2 - (1101)_2 =$
a) 1101 b) 0110 c) 0001 d) 1000
- 14) In bridge rectifier, if input voltage is V_{ms} in wt then PIV across any diode will be
a) $2V_m$ b) V_m c) $\frac{V_m}{\sqrt{2}}$ d) $\frac{V_m}{2}$
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**F.Y. (B.Tech.) (Semester-I) (New CBCS) Examination, 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

Day and Date : Friday, 7-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) Define and derive expression for RMS value of sinusoidal alternating quantity.
- b) State and explain Kirchhoff's laws with sign conventions and enlist its applications.
- c) An iron ring of mean length 50 cms has an air gap of 1 mm and a winding of 200 turns. If the permeability of iron is 300 when a current of 1 A flows through the coil, find the flux density.
- d) Discuss about mutually induced emf. And give one example of electrical device and explain its working principle.
- e) Derive the formula for delta connected resistance using star connection.
- f) A sinusoidal alternating voltage has an r.m.s. value of 200 V and a frequency of 50 Hz. It crosses the zero axis in a positive direction when $t = 0$. Determine the time when voltage first reaches the instantaneous value of 200V.

3. Solve **any two** : **(2×6=12)**

- a) Compare electric and magnetic circuit with their similarities and dissimilarities.
- b) Derive relation between line and phase voltages and currents in balanced star connected 3 phase load.
- c) The voltage applied to a circuit is $v = 100 \sin (\omega t + 30^\circ)$ and the current flowing in the circuit is $i = 15 \sin (\omega t + 60^\circ)$. Determine the impedance, resistance, reactance, power and the power factor of the circuit. Also draw phasor diagram.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) Explain working of Bipolar junction transistor as an amplifier.
 - b) For bridge rectifier derive for :
 - i) Ripple factor
 - ii) Efficiency.
 - c) Perform subtraction using 2' complement :
 - i) $(275)_8 - (155)_8$.
 - d) State and prove the Demorgan's theorem.
 - e) Explain capacitor filter with center tap rectifier.
 - f) Explain construction and working of LVDT.
5. Solve **any two** : **(2×6=12)**
- a) Explain construction and operation of light emitting diode. Write applications of it and explain any one in detail.
 - b) Explain unbonded and bonded strain gauge with neat diagram.
 - c) Prove that :
 - i) $(A + \bar{B} + AB)(A + \bar{B})(\bar{A}B) = 0$
 - ii) $\bar{A}\bar{C} + B\bar{C} + ABC + \bar{A}BC = \bar{A}\bar{C} + B$.
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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 on 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 :

- 1) Isothermal process is governed by
 - a) Boyle's law
 - b) Charle's law
 - c) Joule's law
 - d) Gay lussac's law
- 2) It is impossible to construct device operating in cycle will produce no effect other than heat transfer from colder body to hotter body
 - a) Kelvin Plank law
 - b) Clausius law
 - c) Carnot theorem
 - d) None
- 3) Which of the following is not property of system ?
 - a) Temperature
 - b) Pressure
 - c) Volume
 - d) Heat
- 4) The product of pressure and volume of a fixed amount of gas is approximately constant value is called
 - a) Boyle's law
 - b) Charle's law
 - c) Joule's law
 - d) Gay lussac's law
- 5) For low head and high discharge which pump is used
 - a) Centrifugal pump
 - b) Reciprocating pump
 - c) Vane pump
 - d) None
- 6) Steam turbines are used for
 - a) Electric generation
 - b) Direct drives for fans, compressor
 - c) Large marine propulsion
 - d) All of above



- 7) Otto cycle is known as
a) Constant pressure cycle b) Constant volume cycle
c) Constant temperature cycle d) None
- 8) Compression ratio for petrol engine is
a) 3 to 6 b) 5 to 8 c) 15 to 20 d) 20 to 30
- 9) Type of belt arrangement used to transmit power between two shaft having opposite motion is
a) Open belt b) Cross belt
c) Continuous belt d) None
- 10) Which of the following drive is associated with slip phenomenon ?
a) Belt drive b) Chain drive
c) Gear drive d) None
- 11) Property of material which enables to be drawn into wire is
a) Toughness b) Hardness
c) Malleability d) Ductility
- 12) Which of the following welding process requires external pressure ?
a) Electric arc welding b) Spot welding
c) Oxy-acetylene gas welding d) None
- 13) Which of the following is sliding part of Lathe machine ?
a) Tailstock b) Headstock
c) Both a) and b) d) None
- 14) Strength of brazing joint as compared to welded joint
a) High b) Same
c) Lower d) None
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Seat No.	
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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 type questions.
 - 5) Q. No. **3** and Q. No. **5** are long answer type questions.
 - 6) **Use** of log tables and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Answer **any five** of the following : **(3×5=15)**
- a) Explain open and close thermodynamic system with suitable example.
 - b) A system consist of four process, the energy transfer in each process is tabulated below. Complete the table and determine the net-work of the cycle.

Process	Q(KW)	W(KW)	Δu (KW)
1-2	35	--	30
2-3	25	-5	--
3-4	-20	--	--
4-1	0	12	--

- c) State first law of thermodynamics with its limitations.
 - d) Derive an expression of work done in Isothermal process.
 - e) Explain centrifugal pump with the help of a neat sketch and mention need of priming.
 - f) Differentiate between reciprocating and centrifugal pumps.
 - g) Explain nuclear reactor in detail.
3. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : **13**
- a) Air flows in a compressed at a rate of 0.75 kg/s. The air enters at 5.5 m/s velocity and 110 KPa pressure, 0.87 m³/kg volume and leaving at 3.5 m/s, 720 KPa and 0.20 m³/kg. The internal energy of the air leaving is 95 kJ/kg greater than that of entering. Cooling water is compressor jackets absorbs heat from air at rate of 65 kW. **5**
 - i) Determine the rate of shaft work input to the air in kW.
 - ii) Find the ratio of inlet pipe diameter to outlet pipe diameter.
 - b) With the help of neat sketch, explain working of Hydroelectric power plant. **5**



- c) 1.5 kg air at 15 bar and 0.25 m³ volume is expanded to volume 0.85 m³. Determine the final temperature, work done and heat transfer during the process. If expansion is at constant pressure. Take R = 0.287 kJ/kgk and Cv = 0.7 kJ/kgk for air. 4
- d) How pumps are classified ? Explain with the neat sketch the working centrifugal pump. 4
- e) With the help of neat sketch, explain working of Thermal (Steam) power plant. 4
- f) In a non-flow reversible process pressure and volume are related by $P = V^2 + (15/V)$ where P is pressure in Kpa and V is in m³. During the process volume changes from 1.3 m³ to 5.5 m³. The heat added during the process is 100 KJ. Find the change in internal energy during the process. 4

SECTION – II

4. Solve **any five** out of seven : (3×5=15)
- Compare S.I. and C.I. Engines.
 - Derive an expression for air standard efficiency of Otto cycle.
 - Explain in brief open and crossed belt drives.
 - Explain compound gear train with neat sketch.
 - Explain **any three** of the following properties of material in brief :
 - 1) Strength
 - 2) Ductility
 - 3) Malleability
 - 4) Hardness.
 - Describe the steps involved in design process.
 - Explain with neat sketch Electric Resistance welding.
5. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : 13
- An engine operates on air standard diesel cycle. The pressure and temperature at the beginning of compression are 100 kPa and 27°C. The compression ratio is 18. The heat added per kg of air is 1850 kJ. Determine maximum pressure, maximum temperature, thermal efficiency and net work done. 5
 - Draw neat sketch of a lathe machine showing its different elements and state the functions of headstock and tail stock. 5
 - Two pulleys having diameters 2 m and 1.5 m are separated by a distance of 5 m the initial tension in the belt is 3 kN. The coefficient of friction between the belt and the pulley is 0.3. Calculate the power transmitted by the open belt, when smaller pulley rotates at 200 rpm. 4
 - Write note on 'aesthetic consideration' in design. 4
 - Explain the working of Horizontal Milling machine with neat sketch. 4
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. 4



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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 on 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 :

- 1) Compression ratio for petrol engine is
a) 3 to 6 b) 5 to 8 c) 15 to 20 d) 20 to 30
- 2) Type of belt arrangement used to transmit power between two shaft having opposite motion is
a) Open belt b) Cross belt
c) Continuous belt d) None
- 3) Which of the following drive is associated with slip phenomenon ?
a) Belt drive b) Chain drive
c) Gear drive d) None
- 4) Property of material which enables to be drawn into wire is
a) Toughness b) Hardness
c) Malleability d) Ductility
- 5) Which of the following welding process requires external pressure ?
a) Electric arc welding b) Spot welding
c) Oxy-acetylene gas welding d) None
- 6) Which of the following is sliding part of Lathe machine ?
a) Tailstock b) Headstock
c) Both a) and b) d) None



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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 type questions.
 - 5) Q. No. **3** and Q. No. **5** are long answer type questions.
 - 6) **Use** of log tables and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Answer **any five** of the following : **(3×5=15)**
- a) Explain open and close thermodynamic system with suitable example.
 - b) A system consist of four process, the energy transfer in each process is tabulated below. Complete the table and determine the net-work of the cycle.

Process	Q(KW)	W(KW)	Δu (KW)
1-2	35	--	30
2-3	25	-5	--
3-4	-20	--	--
4-1	0	12	--

- c) State first law of thermodynamics with its limitations.
 - d) Derive an expression of work done in Isothermal process.
 - e) Explain centrifugal pump with the help of a neat sketch and mention need of priming.
 - f) Differentiate between reciprocating and centrifugal pumps.
 - g) Explain nuclear reactor in detail.
3. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : **13**
- a) Air flows in a compressed at a rate of 0.75 kg/s. The air enters at 5.5 m/s velocity and 110 KPa pressure, 0.87 m³/kg volume and leaving at 3.5 m/s, 720 KPa and 0.20 m³/kg. The internal energy of the air leaving is 95 kJ/kg greater than that of entering. Cooling water is compressor jackets absorbs heat from air at rate of 65 kW. **5**
 - i) Determine the rate of shaft work input to the air in kW.
 - ii) Find the ratio of inlet pipe diameter to outlet pipe diameter.
 - b) With the help of neat sketch, explain working of Hydroelectric power plant. **5**



- c) 1.5 kg air at 15 bar and 0.25 m³ volume is expanded to volume 0.85 m³. Determine the final temperature, work done and heat transfer during the process. If expansion is at constant pressure. Take R = 0.287 kJ/kgk and Cv = 0.7 kJ/kgk for air. 4
- d) How pumps are classified ? Explain with the neat sketch the working centrifugal pump. 4
- e) With the help of neat sketch, explain working of Thermal (Steam) power plant. 4
- f) In a non-flow reversible process pressure and volume are related by $P = V^2 + (15/V)$ where P is pressure in Kpa and V is in m³. During the process volume changes from 1.3 m³ to 5.5 m³. The heat added during the process is 100 KJ. Find the change in internal energy during the process. 4

SECTION – II

4. Solve **any five** out of seven : (3×5=15)
- Compare S.I. and C.I. Engines.
 - Derive an expression for air standard efficiency of Otto cycle.
 - Explain in brief open and crossed belt drives.
 - Explain compound gear train with neat sketch.
 - Explain **any three** of the following properties of material in brief :
 - 1) Strength
 - 2) Ductility
 - 3) Malleability
 - 4) Hardness.
 - Describe the steps involved in design process.
 - Explain with neat sketch Electric Resistance welding.
5. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : 13
- An engine operates on air standard diesel cycle. The pressure and temperature at the beginning of compression are 100 kPa and 27°C. The compression ratio is 18. The heat added per kg of air is 1850 kJ. Determine maximum pressure, maximum temperature, thermal efficiency and net work done. 5
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 - Write note on 'aesthetic consideration' in design. 4
 - Explain the working of Horizontal Milling machine with neat sketch. 4
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. 4



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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 on 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 :

- 1) For low head and high discharge which pump is used
 - a) Centrifugal pump
 - b) Reciprocating pump
 - c) Vane pump
 - d) None
- 2) Steam turbines are used for
 - a) Electric generation
 - b) Direct drives for fans, compressor
 - c) Large marine propulsion
 - d) All of above
- 3) Otto cycle is known as
 - a) Constant pressure cycle
 - b) Constant volume cycle
 - c) Constant temperature cycle
 - d) None
- 4) Compression ratio for petrol engine is
 - a) 3 to 6
 - b) 5 to 8
 - c) 15 to 20
 - d) 20 to 30
- 5) Type of belt arrangement used to transmit power between two shaft having opposite motion is
 - a) Open belt
 - b) Cross belt
 - c) Continuous belt
 - d) None
- 6) Which of the following drive is associated with slip phenomenon ?
 - a) Belt drive
 - b) Chain drive
 - c) Gear drive
 - d) None



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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 type questions.
 - 5) Q. No. **3** and Q. No. **5** are long answer type questions.
 - 6) **Use** of log tables and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Answer **any five** of the following : **(3×5=15)**
- a) Explain open and close thermodynamic system with suitable example.
 - b) A system consist of four process, the energy transfer in each process is tabulated below. Complete the table and determine the net-work of the cycle.

Process	Q(KW)	W(KW)	Δu (KW)
1-2	35	--	30
2-3	25	-5	--
3-4	-20	--	--
4-1	0	12	--

- c) State first law of thermodynamics with its limitations.
 - d) Derive an expression of work done in Isothermal process.
 - e) Explain centrifugal pump with the help of a neat sketch and mention need of priming.
 - f) Differentiate between reciprocating and centrifugal pumps.
 - g) Explain nuclear reactor in detail.
3. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : **13**
- a) Air flows in a compressed at a rate of 0.75 kg/s. The air enters at 5.5 m/s velocity and 110 KPa pressure, 0.87 m³/kg volume and leaving at 3.5 m/s, 720 KPa and 0.20 m³/kg. The internal energy of the air leaving is 95 kJ/kg greater than that of entering. Cooling water is compressor jackets absorbs heat from air at rate of 65 kW. **5**
 - i) Determine the rate of shaft work input to the air in kW.
 - ii) Find the ratio of inlet pipe diameter to outlet pipe diameter.
 - b) With the help of neat sketch, explain working of Hydroelectric power plant. **5**



- c) 1.5 kg air at 15 bar and 0.25 m³ volume is expanded to volume 0.85 m³. Determine the final temperature, work done and heat transfer during the process. If expansion is at constant pressure. Take R = 0.287 kJ/kgk and Cv = 0.7 kJ/kgk for air. 4
- d) How pumps are classified ? Explain with the neat sketch the working centrifugal pump. 4
- e) With the help of neat sketch, explain working of Thermal (Steam) power plant. 4
- f) In a non-flow reversible process pressure and volume are related by $P = V^2 + (15/V)$ where P is pressure in Kpa and V is in m³. During the process volume changes from 1.3 m³ to 5.5 m³. The heat added during the process is 100 KJ. Find the change in internal energy during the process. 4

SECTION – II

4. Solve **any five** out of seven : (3×5=15)
- Compare S.I. and C.I. Engines.
 - Derive an expression for air standard efficiency of Otto cycle.
 - Explain in brief open and crossed belt drives.
 - Explain compound gear train with neat sketch.
 - Explain **any three** of the following properties of material in brief :
 - 1) Strength
 - 2) Ductility
 - 3) Malleability
 - 4) Hardness.
 - Describe the steps involved in design process.
 - Explain with neat sketch Electric Resistance welding.
5. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : 13
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 - Write note on 'aesthetic consideration' in design. 4
 - Explain the working of Horizontal Milling machine with neat sketch. 4
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. 4



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**First Year B.Tech. (Semester – I) (CBCS) Examination, 2018
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018
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 type questions.
 - 5) Q. No. **3** and Q. No. **5** are long answer type questions.
 - 6) **Use** of log tables and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Answer **any five** of the following : **(3×5=15)**
- a) Explain open and close thermodynamic system with suitable example.
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3-4	-20	--	--
4-1	0	12	--

- c) State first law of thermodynamics with its limitations.
 - d) Derive an expression of work done in Isothermal process.
 - e) Explain centrifugal pump with the help of a neat sketch and mention need of priming.
 - f) Differentiate between reciprocating and centrifugal pumps.
 - g) Explain nuclear reactor in detail.
3. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : **13**
- a) Air flows in a compressed at a rate of 0.75 kg/s. The air enters at 5.5 m/s velocity and 110 KPa pressure, 0.87 m³/kg volume and leaving at 3.5 m/s, 720 KPa and 0.20 m³/kg. The internal energy of the air leaving is 95 kJ/kg greater than that of entering. Cooling water is compressor jackets absorbs heat from air at rate of 65 kW. **5**
 - i) Determine the rate of shaft work input to the air in kW.
 - ii) Find the ratio of inlet pipe diameter to outlet pipe diameter.
 - b) With the help of neat sketch, explain working of Hydroelectric power plant. **5**



- c) 1.5 kg air at 15 bar and 0.25 m^3 volume is expanded to volume 0.85 m^3 . Determine the final temperature, work done and heat transfer during the process. If expansion is at constant pressure. Take $R = 0.287 \text{ kJ/kgK}$ and $C_v = 0.7 \text{ kJ/kgK}$ for air. 4
- d) How pumps are classified ? Explain with the neat sketch the working centrifugal pump. 4
- e) With the help of neat sketch, explain working of Thermal (Steam) power plant. 4
- f) In a non-flow reversible process pressure and volume are related by $P = V^2 + (15/V)$ where P is pressure in Kpa and V is in m^3 . During the process volume changes from 1.3 m^3 to 5.5 m^3 . The heat added during the process is 100 KJ. Find the change in internal energy during the process. 4

SECTION – II

4. Solve **any five** out of seven : (3×5=15)
- Compare S.I. and C.I. Engines.
 - Derive an expression for air standard efficiency of Otto cycle.
 - Explain in brief open and crossed belt drives.
 - Explain compound gear train with neat sketch.
 - Explain **any three** of the following properties of material in brief :
 - 1) Strength
 - 2) Ductility
 - 3) Malleability
 - 4) Hardness.
 - Describe the steps involved in design process.
 - Explain with neat sketch Electric Resistance welding.
5. Solve **any one** out of **a)** and **b)** and solve **any two** out of **c)** to **f)** : 13
- An engine operates on air standard diesel cycle. The pressure and temperature at the beginning of compression are 100 kPa and 27°C . The compression ratio is 18. The heat added per kg of air is 1850 kJ. Determine maximum pressure, maximum temperature, thermal efficiency and net work done. 5
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 - Write note on 'aesthetic consideration' in design. 4
 - Explain the working of Horizontal Milling machine with neat sketch. 4
 - Explain with neat sketch brazing process. State its advantages, limitations and applications. 4



SLR-BT – 5

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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.**

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 answer :

(14×1=14)

SECTION – I

- 1) Donor type semiconductor is formed by adding impurity of valency
a) 5 b) 4 c) 3 d) 6
- 2) The atomic radius of FCC lattice is
a) $\sqrt{3}a/4$ b) $\sqrt{2}a/4$ c) $a/2$ d) $a/4$
- 3) A plane parallel to one of the co-ordinate axes has an intercept of
a) 1 b) 0 c) ∞ d) none of these
- 4) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency
a) f b) $f/2$ c) $3f$ d) $2f$
- 5) Optimum reverberation time for music is
a) 1 to 2 second b) 0 to 1 second
c) 0.5 to 1 second d) above 5 second

P.T.O.



- 6) The Lorentz transformation equation for t' co-ordinate from s to s'
- a) $t' = (t + vx/c^2)/\sqrt{1 - v^2/c^2}$ b) $t' = (t - vx/c^2)/\sqrt{1 - v^2/c^2}$
 c) $t' = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t' = (t + vx)/\sqrt{1 - v^2/c^2}$
- 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) The resolving power of a grating is
- a) λ/d b) d/λ c) $nNd\lambda$ d) $n(n + 1)$
- 9) The specific rotation of a substance is _____ concentration of solution.
- a) independent of b) directly proportional to
 c) inversely proportional to d) none of these
- 10) Spontaneous emission process is represented by equation
- a) $A + h\gamma \rightarrow A^*$ b) $A^* + h\gamma \rightarrow A + 2h\gamma$
 c) $A^* \rightarrow A + h\gamma$ d) $A^* + h\gamma \rightarrow A + h\gamma$
- 11) LASER beam is
- a) Highly directional b) Extremely bright
 c) Monochromatic d) All of these
- 12) The fractional refractive index change (Δ) is given by
- a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
 c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$
- 13) The acceptance cone of fibre is equal to
- a) $2 \times$ acceptance angle b) $3 \times$ acceptance angle
 c) acceptance angle d) none
- 14) The chirality of armchair CNT is
- a) (a, b) b) (a, a) c) (a, 0) d) (0, b)



Seat No.	
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.

SECTION – I

2. Attempt **any six** of the following : **18**
- a) Classify conductor, insulator and semiconductor on the basis of energy band structure.
 - b) Explain with diagrams the position of Fermi level in
 - 1) P-type
 - 2) n-type semiconductors.
 - c) Define atomic radius and obtain its values for SC, BCC and FCC crystals.
 - d) State the properties of ultrasonic waves.
 - e) Derive an expression for Time dilation.
 - f) Derive the relation $E = mc^2$.
 - g) Determine the lattice constant for FCC lead crystal of radius $1.746A^\circ$. Also find the spacing of :
 - i) (111) planes
 - ii) (200) planes.
 - h) The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m^2 . If the volume of the hall is 1200 m^3 . Find the absorption coefficient.
3. Attempt **any two** of the following : **10**
- a) What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.
 - b) Explain the term Miller indices. Derive the relation between lattice constant and interplaner spacing for cubic crystal.
 - c) State and explain the factors affecting the architectural acoustics and their remedies.

Set P



- d) i) A rocket ship is 100 meter long on the ground. When it is in flight, its length is 99 meters to an observer on the ground. What is its speed ?
- ii) The proper life of these π mesons is 2.5×10^{-8} sec. What is the velocity of π mesons if the observed mean life is 2.5×10^{-7} sec ?

SECTION – II

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

18

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) State and explain Malus law.
- c) Explain in brief :
- a) Metastable state
- b) Pumping
- c) Population inversion
- d) Write any 5 applications of laser in different fields.
- e) Describe the principle on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of clad material is 1.3. What is the value of critical angle ? Also calculate the value of angle of acceptance.
- h) An enclosure filled with helium is heated to 400 k. A beam of helium of atoms emerges out of the enclosure. Calculate the De Broglies wavelength corresponding to helium atoms. Mass of helium atom is 6.7×10^{-27} kg. Given ($h = 6.634 \times 10^{-34}$ J.s, $k = 1.376 \times 10^{-27}$ J/deg).

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

10

- a) i) Determine the grating element of a grating if when illuminated with light of wavelength 4000 \AA , the second order spectrum is seen at an angle of 26° .
- ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm. length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.



Seat No.	
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Set	Q
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.**

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 answer :

(14×1=14)

SECTION – I

- 1) A plane parallel to one of the co-ordinate axes has an intercept of
a) 1 b) 0 c) ∞ d) none of these
- 2) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency
a) f b) $f/2$ c) $3f$ d) $2f$
- 3) Optimum reverberation time for music is
a) 1 to 2 second b) 0 to 1 second
c) 0.5 to 1 second d) above 5 second
- 4) The Lorentz transformation equation for t' co-ordinate from s to s'
a) $t' = (t + vx/c^2)/\sqrt{1 - v^2/c^2}$ b) $t' = (t - vx/c^2)/\sqrt{1 - v^2/c^2}$
c) $t' = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t' = (t + vx)/\sqrt{1 - v^2/c^2}$

P.T.O.



- 5) 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
- 6) Donor type semiconductor is formed by adding impurity of valency
- 5
 - 4
 - 3
 - 6
- 7) The atomic radius of FCC lattice is
- $\sqrt{3}a/4$
 - $\sqrt{2}a/4$
 - $a/2$
 - $a/4$

SECTION – II

- 8) Spontaneous emission process is represented by equation
- $A + h\nu \rightarrow A^*$
 - $A^* + h\nu \rightarrow A + 2h\nu$
 - $A^* \rightarrow A + h\nu$
 - $A^* + h\nu \rightarrow A + h\nu$
- 9) LASER beam is
- Highly directional
 - Extremely bright
 - Monochromatic
 - All of these
- 10) The fractional refractive index change (Δ) is given by
- $\Delta = n_1 - n_2$
 - $\Delta = n_2 - n_1$
 - $\Delta = n_1 - n_2/n_1$
 - $\Delta = n_2 - n_1/n_1$
- 11) The acceptance cone of fibre is equal to
- $2 \times$ acceptance angle
 - $3 \times$ acceptance angle
 - acceptance angle
 - none
- 12) The chirality of armchair CNT is
- (a, b)
 - (a, a)
 - (a, 0)
 - (0, b)
- 13) The resolving power of a grating is
- $\lambda/d \lambda$
 - $d\lambda/\lambda$
 - $nNd\lambda$
 - $n(n + 1)$
- 14) The specific rotation of a substance is _____ concentration of solution.
- independent of
 - directly proportional to
 - inversely proportional to
 - none of these



Seat No.	
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.

SECTION – I

2. Attempt **any six** of the following : **18**
- a) Classify conductor, insulator and semiconductor on the basis of energy band structure.
 - b) Explain with diagrams the position of Fermi level in
 - 1) P-type
 - 2) n-type semiconductors.
 - c) Define atomic radius and obtain its values for SC, BCC and FCC crystals.
 - d) State the properties of ultrasonic waves.
 - e) Derive an expression for Time dilation.
 - f) Derive the relation $E = mc^2$.
 - g) Determine the lattice constant for FCC lead crystal of radius $1.746A^\circ$. Also find the spacing of :
 - i) (111) planes
 - ii) (200) planes.
 - h) The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m^2 . If the volume of the hall is 1200 m^3 . Find the absorption coefficient.
3. Attempt **any two** of the following : **10**
- a) What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.
 - b) Explain the term Miller indices. Derive the relation between lattice constant and interplaner spacing for cubic crystal.
 - c) State and explain the factors affecting the architectural acoustics and their remedies.

Set Q



- d) i) A rocket ship is 100 meter long on the ground. When it is in flight, its length is 99 meters to an observer on the ground. What is its speed ?
- ii) The proper life of these π mesons is 2.5×10^{-8} sec. What is the velocity of π mesons if the observed mean life is 2.5×10^{-7} sec ?

SECTION – II

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

18

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) State and explain Malus law.
- c) Explain in brief :
- a) Metastable state
- b) Pumping
- c) Population inversion
- d) Write any 5 applications of laser in different fields.
- e) Describe the principle on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of clad material is 1.3. What is the value of critical angle ? Also calculate the value of angle of acceptance.
- h) An enclosure filled with helium is heated to 400 k. A beam of helium of atoms emerges out of the enclosure. Calculate the De Broglies wavelength corresponding to helium atoms. Mass of helium atom is 6.7×10^{-27} kg. Given ($h = 6.634 \times 10^{-34}$ J.s, $k = 1.376 \times 10^{-27}$ J/deg).

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

10

- a) i) Determine the grating element of a grating if when illuminated with light of wavelength 4000 \AA , the second order spectrum is seen at an angle of 26° .
- ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm. length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.



SLR-BT – 5

Seat No.	
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Set	R
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.**

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 answer :

(14×1=14)

SECTION – I

- 1) 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
- 2) Donor type semiconductor is formed by adding impurity of valency
 - a) 5
 - b) 4
 - c) 3
 - d) 6
- 3) The atomic radius of FCC lattice is
 - a) $\sqrt{3}a/4$
 - b) $\sqrt{2}a/4$
 - c) $a/2$
 - d) $a/4$
- 4) A plane parallel to one of the co-ordinate axes has an intercept of
 - a) 1
 - b) 0
 - c) ∞
 - d) none of these

P.T.O.



- 5) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency
- a) f b) $f/2$ c) $3f$ d) $2f$
- 6) Optimum reverberation time for music is
- a) 1 to 2 second b) 0 to 1 second
c) 0.5 to 1 second d) above 5 second
- 7) The Lorentz transformation equation for t' co-ordinate from s to s'
- a) $t' = (t + vx/c^2)/\sqrt{1 - v^2/c^2}$ b) $t' = (t - vx/c^2)/\sqrt{1 - v^2/c^2}$
c) $t' = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t' = (t + vx)/\sqrt{1 - v^2/c^2}$

SECTION – II

- 8) The chirality of armchair CNT is
- a) (a, b) b) (a, a) c) (a, 0) d) (0, b)
- 9) The resolving power of a grating is
- a) λ/d b) $d\lambda/\lambda$ c) $nNd\lambda$ d) $n(n + 1)$
- 10) The specific rotation of a substance is _____ concentration of solution.
- a) independent of b) directly proportional to
c) inversely proportional to d) none of these
- 11) Spontaneous emission process is represented by equation
- a) $A + h\gamma \rightarrow A^*$ b) $A^* + h\gamma \rightarrow A + 2h\gamma$
c) $A^* \rightarrow A + h\gamma$ d) $A^* + h\gamma \rightarrow A + h\gamma$
- 12) LASER beam is
- a) Highly directional b) Extremely bright
c) Monochromatic d) All of these
- 13) The fractional refractive index change (Δ) is given by
- a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$
- 14) The acceptance cone of fibre is equal to
- a) $2 \times$ acceptance angle b) $3 \times$ acceptance angle
c) acceptance angle d) none



Seat No.	
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.

SECTION – I

2. Attempt **any six** of the following : **18**
- a) Classify conductor, insulator and semiconductor on the basis of energy band structure.
 - b) Explain with diagrams the position of Fermi level in
 - 1) P-type
 - 2) n-type semiconductors.
 - c) Define atomic radius and obtain its values for SC, BCC and FCC crystals.
 - d) State the properties of ultrasonic waves.
 - e) Derive an expression for Time dilation.
 - f) Derive the relation $E = mc^2$.
 - g) Determine the lattice constant for FCC lead crystal of radius 1.746\AA . Also find the spacing of :
 - i) (111) planes
 - ii) (200) planes.
 - h) The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m^2 . If the volume of the hall is 1200 m^3 . Find the absorption coefficient.
3. Attempt **any two** of the following : **10**
- a) What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.
 - b) Explain the term Miller indices. Derive the relation between lattice constant and interplaner spacing for cubic crystal.
 - c) State and explain the factors affecting the architectural acoustics and their remedies.

Set R



- d) i) A rocket ship is 100 meter long on the ground. When it is in flight, its length is 99 meters to an observer on the ground. What is its speed ?
- ii) The proper life of these π mesons is 2.5×10^{-8} sec. What is the velocity of π mesons if the observed mean life is 2.5×10^{-7} sec ?

SECTION – II

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

18

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) State and explain Malus law.
- c) Explain in brief :
- a) Metastable state
- b) Pumping
- c) Population inversion
- d) Write any 5 applications of laser in different fields.
- e) Describe the principle on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of clad material is 1.3. What is the value of critical angle ? Also calculate the value of angle of acceptance.
- h) An enclosure filled with helium is heated to 400 k. A beam of helium of atoms emerges out of the enclosure. Calculate the De Broglies wavelength corresponding to helium atoms. Mass of helium atom is 6.7×10^{-27} kg. Given ($h = 6.634 \times 10^{-34}$ J.s, $k = 1.376 \times 10^{-27}$ J/deg).

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

10

- a) i) Determine the grating element of a grating if when illuminated with light of wavelength 4000 \AA , the second order spectrum is seen at an angle of 26° .
- ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm. length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.



SLR-BT – 5

Seat No.	
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Set	S
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.**

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}/\text{k.mol}$.
2) Velocity of light, $c = 3 \times 10^8 \text{ m/sec}$.
3) Charge of electron, $e = 1.6 \times 10^{-19} \text{ C}$.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

SECTION – I

1) The Lorentz transformation equation for t' co-ordinate from s to s'

a) $t' = (t + vx/c^2)/\sqrt{1 - v^2/c^2}$

b) $t' = (t - vx/c^2)/\sqrt{1 - v^2/c^2}$

c) $t' = (t - vx)/\sqrt{1 - v^2/c^2}$

d) $t' = (t + vx)/\sqrt{1 - v^2/c^2}$

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) Donor type semiconductor is formed by adding impurity of valency

a) 5

b) 4

c) 3

d) 6

4) The atomic radius of FCC lattice is

a) $\sqrt{3}a/4$

b) $\sqrt{2}a/4$

c) $a/2$

d) $a/4$

P.T.O.



- 5) A plane parallel to one of the co-ordinate axes has an intercept of
a) 1 b) 0 c) ∞ d) none of these
- 6) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency
a) f b) $f/2$ c) $3f$ d) $2f$
- 7) Optimum reverberation time for music is
a) 1 to 2 second b) 0 to 1 second
c) 0.5 to 1 second d) above 5 second

SECTION – II

- 8) The acceptance cone of fibre is equal to
a) $2 \times$ acceptance angle b) $3 \times$ acceptance angle
c) acceptance angle d) none
- 9) The chirality of armchair CNT is
a) (a, b) b) (a, a) c) (a, 0) d) (0, b)
- 10) The resolving power of a grating is
a) $\lambda/d \lambda$ b) $d\lambda/\lambda$ c) $nNd\lambda$ d) $n(n + 1)$
- 11) The specific rotation of a substance is _____ concentration of solution.
a) independent of b) directly proportional to
c) inversely proportional to d) none of these
- 12) Spontaneous emission process is represented by equation
a) $A + h\gamma \rightarrow A^*$ b) $A^* + h\gamma \rightarrow A + 2h\gamma$
c) $A^* \rightarrow A + h\gamma$ d) $A^* + h\gamma \rightarrow A + h\gamma$
- 13) LASER beam is
a) Highly directional b) Extremely bright
c) Monochromatic d) All of these
- 14) The fractional refractive index change (Δ) is given by
a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$



Seat No.	
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**F.Y. B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING PHYSICS**

Day and Date : Wednesday, 12-12-2018
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.

SECTION – I

2. Attempt **any six** of the following : **18**
- a) Classify conductor, insulator and semiconductor on the basis of energy band structure.
 - b) Explain with diagrams the position of Fermi level in
 - 1) P-type
 - 2) n-type semiconductors.
 - c) Define atomic radius and obtain its values for SC, BCC and FCC crystals.
 - d) State the properties of ultrasonic waves.
 - e) Derive an expression for Time dilation.
 - f) Derive the relation $E = mc^2$.
 - g) Determine the lattice constant for FCC lead crystal of radius 1.746\AA . Also find the spacing of :
 - i) (111) planes
 - ii) (200) planes.
 - h) The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m^2 . If the volume of the hall is 1200 m^3 . Find the absorption coefficient.
3. Attempt **any two** of the following : **10**
- a) What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.
 - b) Explain the term Miller indices. Derive the relation between lattice constant and interplaner spacing for cubic crystal.
 - c) State and explain the factors affecting the architectural acoustics and their remedies.

Set S



- d) i) A rocket ship is 100 meter long on the ground. When it is in flight, its length is 99 meters to an observer on the ground. What is its speed ?
- ii) The proper life of these π mesons is 2.5×10^{-8} sec. What is the velocity of π mesons if the observed mean life is 2.5×10^{-7} sec ?

SECTION – II

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

18

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) State and explain Malus law.
- c) Explain in brief :
- Metastable state
 - Pumping
 - Population inversion
- d) Write any 5 applications of laser in different fields.
- e) Describe the principle on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of clad material is 1.3. What is the value of critical angle ? Also calculate the value of angle of acceptance.
- h) An enclosure filled with helium is heated to 400 k. A beam of helium of atoms emerges out of the enclosure. Calculate the De Broglies wavelength corresponding to helium atoms. Mass of helium atom is 6.7×10^{-27} kg. Given ($h = 6.634 \times 10^{-34}$ J.s, $k = 1.376 \times 10^{-27}$ J/deg).

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

10

- a) i) Determine the grating element of a grating if when illuminated with light of wavelength 4000 \AA , the second order spectrum is seen at an angle of 26° .
- ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm. length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.



Seat No.	
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Set	P
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**First Year B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING CHEMISTRY**

Day and Date : Wednesday, 12-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicates **full** marks.
 - 2) Draw **neat** and labelled diagrams **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 correct option :

14

- 1) During wet corrosion
 - a) The anodic part undergoes oxidation
 - b) The cathodic part undergoes oxidation
 - c) The anodic part undergoes reduction
 - d) Neither anodic nor cathodic part under goes any changes
- 2) Metal at the top of electromotive series is
 - a) Most stable
 - b) Least active
 - c) Most noble
 - d) Most active
- 3) A suitable lubricant for watches is
 - a) Grease
 - b) Graphite
 - c) Molybdenum disulphide
 - d) Palm oil
- 4) Greases are not used to lubricate
 - a) rail axel boxes
 - b) gears
 - c) bearings working at high temp.
 - d) watches
- 5) Desalination is a process of removing
 - a) oil
 - b) mineral acids
 - c) common salt
 - d) hardness from water



- 6) Water is hard when it contains
a) acid solution
b) precipitate in suspension
c) dissolved sodium salt
d) dissolved Ca and Mg salt
- 7) A reaction in which either the carbon skeleton or the functional group or both are modified is known as
a) addition reaction
b) substitution reaction
c) elimination reaction
d) rearrangement reaction
- 8) With increase in percentage of carbon in metal, the hardness
a) Decreases
b) Do not change
c) Increases
d) None of these
- 9) Glass used extensively for making superior laboratory apparatus is
a) Soda glass
b) Potash glass
c) Borosilicate glass
d) Flint glass
- 10) The lowest boiling fraction of crude oil is
a) Heavy oil
b) Kerosene oil
c) Diesel oil
d) Gasoline or petrol
- 11) A good fuel should have
a) High moisture content
b) Low calorific value
c) Moderate ignition temperature
d) High ash content
- 12) Isoprene is a monomer of
a) Natural rubber
b) Synthetic rubber
c) Starch
d) PVC
- 13) The process of vulcanization makes rubber
a) Soluble in water
b) Hard
c) Soft
d) More elastic
- 14) Which of the following gas can not be used as carrier gas in gas chromatography ?
a) Nitrogen
b) Argon
c) Oxygen
d) All of these
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Seat No.	
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Marks : 56

- Instructions :** 1) Figures to the **right** indicates **full** marks.
2) Draw **neat** and labelled diagrams **whenever** necessary.

SECTION – I

2. Solve **any four** : **16**

- a) A sample of water on analysis was found to contain the following impurities in mg/lit., calculates temporary, permanent and total hardness of water in mg/lit.

Impurities	Amount	Mol. Wt.
$\text{Ca}(\text{HCO}_3)_2$	130	162
$\text{Mg}(\text{HCO}_3)_2$	115	146
CaSO_4	60	136
MgCl_2	45	111

- b) Explain the different types of aerators for treatment of water.
c) How will you prepare Paracetamol ? Give its uses.
d) Explain the mechanism of extreme pressure lubrication.
e) Describe the nature of oxide film formed in oxidation corrosion.
f) Explain the tinning process for prevention of corrosion.

3. Solve **any four** : **12**

- a) Define BOD. How it is determined ?
b) Explain the reverse osmosis process for treatment of hard water.
c) What is addition reaction ? Explain with reaction.



- d) Numerical Saponification value 10.8 grams of oil after saponification with 50 ml of N/2 alkaline KOH solution and on subsequent titration with N/2 HCl gave a titre value of 14 ml to the phenolphthalein end point. A blank experiment was conducted without taking the oil and on repeating the same procedure gave titre value 50 ml. Calculate the saponification value the oil. (Mol. wt. of KOH = 56).
- e) Selection of lubricants for (i) Cutting tools (ii) I.C. engine.
- f) Explain the weight loss method for measurement of rate of corrosion.

SECTION – II

4. Attempt **any four** :

16

- a) What is glass ? Explain general properties of glass.
- b) Calculate gross and net calorific value of a coal sample of coal having C = 83%, H = 7%, O = 2%, S = 1.5%, N = 2% and ash = 4.4%. (Take latent heat of steam = 587 cal/g).
- c) Explain refining of crude oil.
- d) Explain properties and applications of PVC and PET.
- e) Explain vulcanization of rubber. What are advantages of vulcanization ?
- f) Explain construction and working of gas liquid chromatography.

5. Attempt **any four** :

12

- a) Explain composition, properties and applications of steel.
- b) What is biodegradable polymer ? Write examples with applications.
- c) Explain comparison between solid and gaseous fuels.
- d) Explain construction and working of boys calorimeter.
- e) Calculate degree of polymerization of polyethene having molecular weight 18200. (Mol. Wt. of ethane = 28).
- f) What weight of CaCl_2 is required to prepare 0.1 N 500 ml solution and 0.2 M 500 ml solution. (Mol. Wt. of CaCl_2 = 111) ?



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Q

**First Year B.Tech. (Semester – I) (New CBCS) Examination, 2018
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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 correct option :

14

- 1) With increase in percentage of carbon in metal, the hardness
 - a) Decreases
 - b) Do not change
 - c) Increases
 - d) None of these
- 2) Glass used extensively for making superior laboratory apparatus is
 - a) Soda glass
 - b) Potash glass
 - c) Borosilicate glass
 - d) Flint glass
- 3) The lowest boiling fraction of crude oil is
 - a) Heavy oil
 - b) Kerosene oil
 - c) Diesel oil
 - d) Gasoline or petrol
- 4) A good fuel should have
 - a) High moisture content
 - b) Low calorific value
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 - d) High ash content
- 5) Isoprene is a monomer of
 - a) Natural rubber
 - b) Synthetic rubber
 - c) Starch
 - d) PVC
- 6) The process of vulcanization makes rubber
 - a) Soluble in water
 - b) Hard
 - c) Soft
 - d) More elastic



- 7) Which of the following gas can not be used as carrier gas in gas chromatography ?
a) Nitrogen b) Argon c) Oxygen d) All of these
- 8) During wet corrosion
a) The anodic part undergoes oxidation
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c) The anodic part undergoes reduction
d) Neither anodic nor cathodic part under goes any changes
- 9) Metal at the top of electromotive series is
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a) oil
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a) acid solution b) precipitate in suspension
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- 14) A reaction in which either the carbon skeleton or the functional group or both are modified is known as
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**First Year B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING CHEMISTRY**

Day and Date : Wednesday, 12-12-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicates **full** marks.
2) Draw **neat** and labelled diagrams **whenever** necessary.

SECTION – I

2. Solve **any four** : **16**

- a) A sample of water on analysis was found to contain the following impurities in mg/lit., calculates temporary, permanent and total hardness of water in mg/lit.

Impurities	Amount	Mol. Wt.
$\text{Ca}(\text{HCO}_3)_2$	130	162
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- b) Explain the different types of aerators for treatment of water.
c) How will you prepare Paracetamol ? Give its uses.
d) Explain the mechanism of extreme pressure lubrication.
e) Describe the nature of oxide film formed in oxidation corrosion.
f) Explain the tinning process for prevention of corrosion.

3. Solve **any four** : **12**

- a) Define BOD. How it is determined ?
b) Explain the reverse osmosis process for treatment of hard water.
c) What is addition reaction ? Explain with reaction.



- d) Numerical Saponification value 10.8 grams of oil after saponification with 50 ml of N/2 alkaline KOH solution and on subsequent titration with N/2 HCl gave a titre value of 14 ml to the phenolphthalein end point. A blank experiment was conducted without taking the oil and on repeating the same procedure gave titre value 50 ml. Calculate the saponification value the oil. (Mol. wt. of KOH = 56).
- e) Selection of lubricants for (i) Cutting tools (ii) I.C. engine.
- f) Explain the weight loss method for measurement of rate of corrosion.

SECTION – II

4. Attempt **any four** :

16

- a) What is glass ? Explain general properties of glass.
- b) Calculate gross and net calorific value of a coal sample of coal having C = 83%, H = 7%, O = 2%, S = 1.5%, N = 2% and ash = 4.4%. (Take latent heat of steam = 587 cal/g).
- c) Explain refining of crude oil.
- d) Explain properties and applications of PVC and PET.
- e) Explain vulcanization of rubber. What are advantages of vulcanization ?
- f) Explain construction and working of gas liquid chromatography.

5. Attempt **any four** :

12

- a) Explain composition, properties and applications of steel.
- b) What is biodegradable polymer ? Write examples with applications.
- c) Explain comparison between solid and gaseous fuels.
- d) Explain construction and working of boys calorimeter.
- e) Calculate degree of polymerization of polyethene having molecular weight 18200. (Mol. Wt. of ethane = 28).
- f) What weight of CaCl_2 is required to prepare 0.1 N 500 ml solution and 0.2 M 500 ml solution. (Mol. Wt. of CaCl_2 = 111) ?



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R

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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose correct option :

14

- 1) Desalination is a process of removing
 - a) oil
 - b) mineral acids
 - c) common salt
 - d) hardness from water
- 2) Water is hard when it contains
 - a) acid solution
 - b) precipitate in suspension
 - c) dissolved sodium salt
 - d) dissolved Ca and Mg salt
- 3) A reaction in which either the carbon skeleton or the functional group or both are modified is known as
 - a) addition reaction
 - b) substitution reaction
 - c) elimination reaction
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- 4) With increase in percentage of carbon in metal, the hardness
 - a) Decreases
 - b) Do not change
 - c) Increases
 - d) None of these
- 5) Glass used extensively for making superior laboratory apparatus is
 - a) Soda glass
 - b) Potash glass
 - c) Borosilicate glass
 - d) Flint glass

P.T.O.



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**First Year B.Tech. (Semester – I) (New CBCS) Examination, 2018
ENGINEERING CHEMISTRY**

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Marks : 56

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SECTION – I

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CaSO_4	60	136
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- b) Explain the different types of aerators for treatment of water.
c) How will you prepare Paracetamol ? Give its uses.
d) Explain the mechanism of extreme pressure lubrication.
e) Describe the nature of oxide film formed in oxidation corrosion.
f) Explain the tinning process for prevention of corrosion.

3. Solve **any four** : **12**

- a) Define BOD. How it is determined ?
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c) What is addition reaction ? Explain with reaction.



- d) Numerical Saponification value 10.8 grams of oil after saponification with 50 ml of N/2 alkaline KOH solution and on subsequent titration with N/2 HCl gave a titre value of 14 ml to the phenolphthalein end point. A blank experiment was conducted without taking the oil and on repeating the same procedure gave titre value 50 ml. Calculate the saponification value the oil. (Mol. wt. of KOH = 56).
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SECTION – II

4. Attempt **any four** :

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- a) What is glass ? Explain general properties of glass.
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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose correct option :

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- 3) Isoprene is a monomer of
 - a) Natural rubber
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 - c) Starch
 - d) PVC
- 4) The process of vulcanization makes rubber
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 - c) Soft
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- 5) Which of the following gas can not be used as carrier gas in gas chromatography ?
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SECTION – II

4. Attempt **any four** :

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- a) What is glass ? Explain general properties of glass.
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