

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Use of Non – programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The real part of $[\sin(x) + i \cos(x)]^5 =$ _____.
 - a) $\cos(5x)$
 - b) $-\sin(5x)$
 - c) $\sin(5x)$
 - d) $-\cos(5x)$
- 2) $\sinh^{-1} \frac{3}{4} =$ _____.
 - a) $\log 1$
 - b) $\log 2$
 - c) $\log 3$
 - d) $\log 4$
- 3) $\log(1 + i) =$ _____.
 - a) $\log 2 + i$
 - b) $\frac{1}{2} \log 2 - i \frac{\pi}{4}$
 - c) $\frac{1}{2} \log 2 + i \frac{\pi}{4}$
 - d) $\log 2 + i \frac{\pi}{4}$
- 4) If $y = \log x$ the $y_n =$ _____.
 - a) $\frac{(-1)^n (n)!}{x^{n+1}}$
 - b) $\frac{(-1)^n (n-1)!}{x^n}$
 - c) $\frac{(-1)^{n-1} (n)!}{x^{n+1}}$
 - d) $\frac{(-1)^{n-1} (n-1)!}{x^n}$
- 5) If $y = 2^x x$ the $y_n =$ _____.
 - a) $2^x [(\log 2)^n + n(\log 2)^{n-3}]$
 - b) $2^x [(\log 2)^n + (\log 2)^{n-3}]$
 - c) $2^x [(\log 2)^n + n(\log 2)^{n-1}]$
 - d) $2^x [(\log 2)^n + (\log 2)^{n-1}]$
- 6) If $L = \lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ then $L =$ _____.
 - a) $\frac{1}{6}$
 - b) 6
 - c) $\frac{-1}{6}$
 - d) 0
- 7) The expansion of $\log(1 + x^2) =$ _____.
 - a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$
 - b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$
 - c) $-x^2 - \frac{x^4}{2} - \frac{x^6}{3} - \frac{x^8}{4} - \dots$
 - d) $x^2 - \frac{x^4}{2} + \frac{x^6}{3} - \frac{x^8}{4} + \dots$

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Max. Marks: 56

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Section – I

Q.2 Attempt any three questions from the following. 09

- a) Find the nth derivative of $y = \frac{x-1}{x+1} + x^2 \sin x \cos x$.
- b) Simplify $\left(\frac{1+\cos \theta+i \sin \theta}{1+\cos \theta-i \sin \theta}\right)^{1000}$.
- c) If $x = y(1 + y^2)$ Prove that $y = x - x^3 + 3x^5 + \dots$
- d) Prove that $\tan h^{-1}x = \sin h^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$.
- e) Expand $x^5 - 5x^4 + 6x^3 - 7x^2 + 8x - 9$ in power of $(x - 1)$.

Q.3 Attempt any three questions from the following. 09

- a) Prove that $\sin^{-1}(3x - 4x^3) = 3\left[x + \frac{x^3}{6} + \frac{3x^5}{40} + \dots\right]$.
- b) Solve $x^5 = 1 + i$.
- c) Separate into real and imaginary parts $\sin^{-1}\left(\frac{3i}{4}\right)$.
- d) Expand $\log(1 + e^x)$ in powers of x up to x^2 .
- e) Find the nth derivative of $y = e^{-x} \cdot x \cdot \cos x$.

Q.4 Attempt any two questions from the following. 10

- a) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$ prove that

$$\phi = \frac{1}{2} \log \cot \alpha/2$$
and

$$2\theta = n\pi + \frac{\pi}{2} + \alpha$$
- b) If $\sin^{-1}\left(\frac{y}{b}\right) = \log\left(\frac{x}{n}\right)^n$ then prove that

$$x^2 y_{n+2} + (2n + 1)xy_{n+1} + 2n^2 y_n = 0$$
- c) Evaluate the limits.
- a) $\lim_{x \rightarrow 0} \left[\frac{1}{2x} - \frac{1}{x(e^{\pi x} + 1)} \right]$
- b) $\lim_{x \rightarrow 0} \left[\frac{a^x + b^x + c^x}{3} \right]^{1/x}$

Section - II

Q.5 Attempt any three questions from the following. **09**

a) Find the rank of the matrix by reducing it to Normal form.

$$\begin{pmatrix} 3 & 2 & 1 & 4 \\ -1 & 3 & 2 & 2 \\ 2 & 5 & 3 & 6 \\ 5 & 7 & 4 & 10 \end{pmatrix}$$

b) If 120 is divided into three numbers such that sum of their product taken at a time is maximum, find the numbers.

c) If $u = x^3 \sin^{-1} \left[\frac{y}{x} \right] + y^4 \tan^{-1} \left[\frac{y}{x} \right]$ then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$.

d) Examine the vector for Linear Dependence and Independence.
[1,1,1], [1,2,3], [2,3,8]

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

Q.6 Attempt any three questions from the following. **09**

a) Solve the equations.

$$x + y - z + s = 0, x - y + 2z - s = 0, 3x + y + s = 0$$

b) If $x = \frac{1}{2}(u^2 - v^2)$, $y = uv$ and $z = w$ find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$

c) If $u = \log \left[\frac{x^3 + y^3}{x^2 + y^2} \right]$ then Prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -1$

d) If $u = e^{x^2 + y^2 + z^2}$ find the value of $\frac{\partial^3 u}{\partial x \partial y \partial z}$

e) Verify Cayley Hamilton Theorem for A where

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{pmatrix}$$

Q.7 Attempt any two questions from the following. **10**

a) Find the Eigen Values and Eigen Vector for the largest Eigen Value for

$$A = \begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & 1 \\ 1 & -1 & 2 \end{pmatrix}$$

b) Find the stationary value $xy(1 - x - y)$

c) If $u = lx + my$ and $v = ly - mx$ and z is function of u, v then prove that.

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If Rank of matrix $[A]_{3 \times 3}$ is 2, then the value of $|A| =$ _____.
 - a) 1
 - b) 0
 - c) 2
 - d) -1
- 2) The system $3x + 4y - 2z = 4, 6x + 8y - 4z = 10$ will have _____.
 - a) Unique solution
 - b) No solution
 - c) Infinite Solution
 - d) Infinite solution with two independent parameters
- 3) If zero is one of the eigen value of the matrix A then A is _____.
 - a) Singular
 - b) Non singular
 - c) Symmetric
 - d) Non symmetric
- 4) If $u = e^{xy^2z^3}$ then $\frac{\partial u}{\partial z} =$ _____.
 - a) $e^{xy^2z^3} xy^2z^3$
 - b) $e^{xy^2z^3} y^2z^3$
 - c) $e^{xy^2z^3} 3xy^2z^2$
 - d) $e^{xy^2z^3} 2xyz^3$
- 5) If $g(x, y, z) = 0$ then the value of $\frac{\partial z}{\partial x} =$ _____.
 - a) $\frac{\frac{\partial x}{\partial g}}{\frac{\partial z}{\partial g}}$
 - b) $\frac{\frac{\partial y}{\partial g}}{\frac{\partial x}{\partial g}}$
 - c) $-\frac{\frac{\partial g}{\partial y}}{\frac{\partial g}{\partial z}}$
 - d) $-\frac{\frac{\partial g}{\partial x}}{\frac{\partial g}{\partial z}}$
- 6) Consider the following terms.
 - I) $JJ' - 1 = 0$
 - II) $J\left(\frac{u, v}{x, y}\right) \cdot J\left(\frac{x, y}{u, v}\right) - 1 = 0$
 - a) Both I and II are true
 - b) I is true, II is false
 - c) II is true, I is false
 - d) Both I and II are false

- 7) Which of the following is the relative error for u ?
- a) $1 - \frac{\delta u}{u}$ b) $1 + \frac{\delta u}{u}$
- c) $\frac{\delta u}{u}$ d) $\frac{u}{\delta u}$
- 8) The real part of $[\sin(x) + i \cos(x)]^5 =$ _____.
- a) $\cos(5x)$ b) $-\sin(5x)$
- c) $\sin(5x)$ d) $-\cos(5x)$
- 9) $\sin h^{-1} \frac{3}{4} =$ _____.
- a) $\log 1$ b) $\log 2$
- c) $\log 3$ d) $\log 4$
- 10) $\log(1 + i) =$ _____.
- a) $\log 2 + i$ b) $\frac{1}{2} \log 2 - i \frac{\pi}{4}$
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- 11) If $y = \log x$ the $y_n =$ _____.
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- 12) If $y = 2^x x$ the $y_n =$ _____.
- a) $2^x [(\log 2)^n + n(\log 2)^{n-3}]$ b) $2^x [(\log 2)^n + (\log 2)^{n-3}]$
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- 13) If $L = \lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ then $L =$ _____.
- a) $\frac{1}{6}$ b) 6
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- 14) The expansion of $\log(1 + x^2) =$ _____.
- a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$ b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$
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Section – I

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- a) Find the nth derivative of $y = \frac{x-1}{x+1} + x^2 \sin x \cos x$.
- b) Simplify $\left(\frac{1+\cos \theta+i \sin \theta}{1+\cos \theta-i \sin \theta}\right)^{1000}$.
- c) If $x = y(1 + y^2)$ Prove that $y = x - x^3 + 3x^5 + \dots$
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c) Evaluate the limits.

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Section - II

Q.5 Attempt any three questions from the following. **09**

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c) $2^x [(\log 2)^n + n(\log 2)^{n-1}]$	d) $2^x [(\log 2)^n + (\log 2)^{n-1}]$

- 2) If $L = \lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$ then $L =$ _____.

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

- 3) The expansion of $\log(1 + x^2) =$ _____.

a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$	b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$
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- 4) If Rank of matrix $[A]_{3 \times 3}$ is 2, then the value of $|A| =$ _____.

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

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- c) Evaluate the limits.
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Section - II

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c) If $u = x^3 \sin^{-1} \left[\frac{y}{x} \right] + y^4 \tan^{-1} \left[\frac{y}{x} \right]$ then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$.

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c) If $u = \log \left[\frac{x^3 + y^3}{x^2 + y^2} \right]$ then Prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -1$

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b) Find the stationary value $xy(1 - x - y)$

c) If $u = lx + my$ and $v = ly - mx$ and z is function of u, v then prove that.

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.
3) Use of Non – programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- If zero is one of the eigen value of the matrix A then A is _____.
 - Singular
 - Non singular
 - Symmetric
 - Non symmetric
- If $u = e^{xy^2z^3}$ then $\frac{\partial u}{\partial z} =$ _____.
 - $e^{xy^2z^3} xy^2z^3$
 - $e^{xy^2z^3} y^2z^3$
 - $e^{xy^2z^3} 3xy^2z^2$
 - $e^{xy^2z^3} 2xyz^3$
- If $g(x, y, z) = 0$ then the value of $\frac{\partial z}{\partial x} =$ _____.
 - $\frac{\frac{\partial x}{\partial g}}{\frac{\partial z}{\partial g}}$
 - $\frac{\frac{\partial y}{\partial g}}{\frac{\partial x}{\partial g}}$
 - $-\frac{\frac{\partial g}{\partial y}}{\frac{\partial g}{\partial z}}$
 - $-\frac{\frac{\partial g}{\partial x}}{\frac{\partial g}{\partial z}}$
- Consider the following terms.
 - $JJ' - 1 = 0$
 - $J\left(\frac{u, v}{x, y}\right) \cdot J\left(\frac{x, y}{u, v}\right) - 1 = 0$
 - Both I and II are true
 - I is true, II is false
 - II is true, I is false
 - Both I and II are false
- Which of the following is the relative error for u ?
 - $1 - \frac{\delta u}{u}$
 - $1 + \frac{\delta u}{u}$
 - $\frac{\delta u}{u}$
 - $\frac{u}{\delta u}$
- The real part of $[\sin(x) + i \cos(x)]^5 =$ _____.
 - $\cos(5x)$
 - $-\sin(5x)$
 - $\sin(5x)$
 - $-\cos(5x)$

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of Non – programmable calculator is allowed.

Section – I

Q.2 Attempt any three questions from the following. 09

- a) Find the nth derivative of $y = \frac{x-1}{x+1} + x^2 \sin x \cos x$.
- b) Simplify $\left(\frac{1+\cos \theta+i \sin \theta}{1+\cos \theta-i \sin \theta}\right)^{1000}$.
- c) If $x = y(1 + y^2)$ Prove that $y = x - x^3 + 3x^5 + \dots$
- d) Prove that $\tan h^{-1} x = \sin h^{-1} \left(\frac{x}{\sqrt{1-x^2}}\right)$.
- e) Expand $x^5 - 5x^4 + 6x^3 - 7x^2 + 8x - 9$ in power of $(x - 1)$.

Q.3 Attempt any three questions from the following. 09

- a) Prove that $\sin^{-1}(3x - 4x^3) = 3 \left[x + \frac{x^3}{6} + \frac{3x^5}{40} + \dots \right]$.
- b) Solve $x^5 = 1 + i$.
- c) Separate into real and imaginary parts $\sin^{-1} \left(\frac{3i}{4}\right)$.
- d) Expand $\log(1 + e^x)$ in powers of x up to x^2 .
- e) Find the nth derivative of $y = e^{-x} \cdot x \cdot \cos x$.

Q.4 Attempt any two questions from the following. 10

- a) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$ prove that
- $$\phi = \frac{1}{2} \log \cot \alpha/2$$

and

$$2\theta = n\pi + \frac{\pi}{2} + \alpha$$

- b) If $\sin^{-1} \left(\frac{y}{b}\right) = \log \left(\frac{x}{n}\right)^n$ then prove that
- $$x^2 y_{n+2} + (2n + 1) x y_{n+1} + 2n^2 y_n = 0$$

c) Evaluate the limits.

a) $\lim_{x \rightarrow 0} \left[\frac{1}{2x} - \frac{1}{x(e^{\pi x} + 1)} \right]$

b) $\lim_{x \rightarrow 0} \left[\frac{a^x + b^x + c^x}{3} \right]^{1/x}$

Section - II

Q.5 Attempt any three questions from the following. **09**

a) Find the rank of the matrix by reducing it to Normal form.

$$\begin{pmatrix} 3 & 2 & 1 & 4 \\ -1 & 3 & 2 & 2 \\ 2 & 5 & 3 & 6 \\ 5 & 7 & 4 & 10 \end{pmatrix}$$

b) If 120 is divided into three numbers such that sum of their product taken at a time is maximum, find the numbers.

c) If $u = x^3 \sin^{-1} \left[\frac{y}{x} \right] + y^4 \tan^{-1} \left[\frac{y}{x} \right]$ then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$.

d) Examine the vector for Linear Dependence and Independence.
[1,1,1], [1,2,3], [2,3,8]

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

Q.6 Attempt any three questions from the following. **09**

a) Solve the equations.

$$x + y - z + s = 0, x - y + 2z - s = 0, 3x + y + s = 0$$

b) If $x = \frac{1}{2}(u^2 - v^2)$, $y = uv$ and $z = w$ find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$

c) If $u = \log \left[\frac{x^3 + y^3}{x^2 + y^2} \right]$ then Prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -1$

d) If $u = e^{x^2 + y^2 + z^2}$ find the value of $\frac{\partial^3 u}{\partial x \partial y \partial z}$

e) Verify Cayley Hamilton Theorem for A where

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{pmatrix}$$

Q.7 Attempt any two questions from the following. **10**

a) Find the Eigen Values and Eigen Vector for the largest Eigen Value for

$$A = \begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & 1 \\ 1 & -1 & 2 \end{pmatrix}$$

b) Find the stationary value $xy(1 - x - y)$

c) If $u = lx + my$ and $v = ly - mx$ and z is function of u, v then prove that.

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

- 8) If gravitational acceleration at any place is doubled then weight of body will be _____.
- a) $g/2$
 - b) g
 - c) $\sqrt{2}g$
 - d) $2g$
- 9) In a rectilinear motion all the particles in body _____.
- a) have same displacement
 - b) have some velocity
 - c) have some acceleration
 - d) all of these
- 10) D'Alembert's principle correlates _____.
- a) force, mass, velocity, and displacement
 - b) force, mass, and acceleration
 - c) force, time, mass and velocity
 - d) mass and velocity
- 11) Angular momentum is the product of _____.
- a) mass moment of inertia x angular velocity
 - b) mass moment of inertia x angular acceleration
 - c) mass normal of inertia x angular displacement
 - d) none of these
- 12) The time rate of doing work is known as _____.
- a) potential energy
 - b) kinetic energy
 - c) rotational energy
 - d) power
- 13) The bodies which regains their size and shape after impact are called _____.
- a) plastic bodies
 - b) rigid bodies
 - c) elastic bodies
 - d) partially plastic bodied
- 14) Impulse is measured in _____.
- a) $N - sec$
 - b) N /sec
 - c) N/ sec^2
 - d) N

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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS**

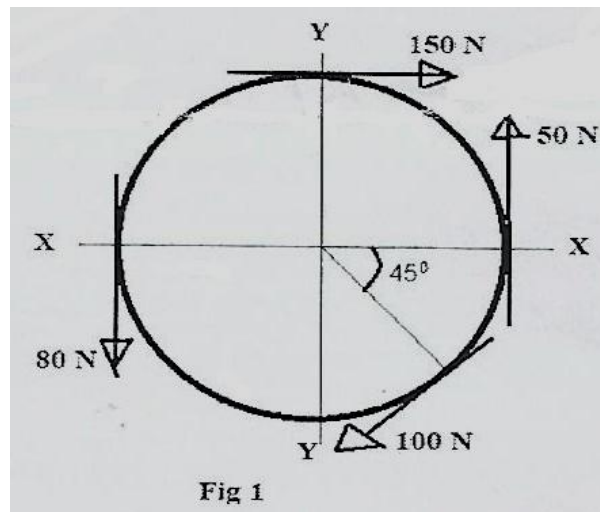
Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

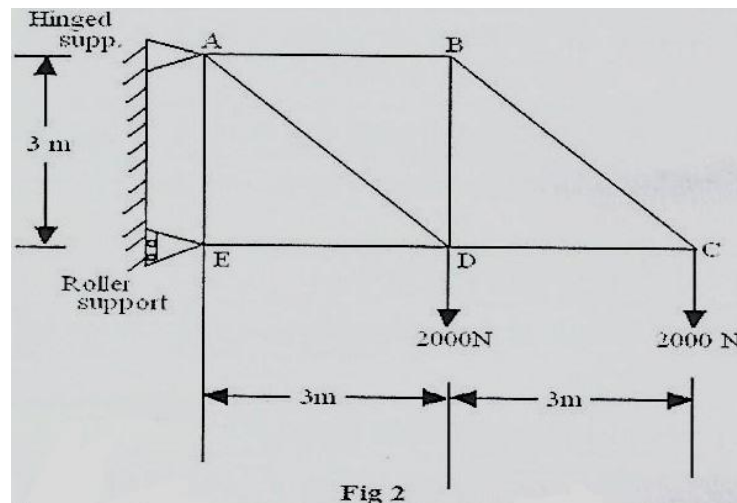
- Instructions:**
- 1) All questions are compulsory.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data if necessary and state it clearly.

Section – I

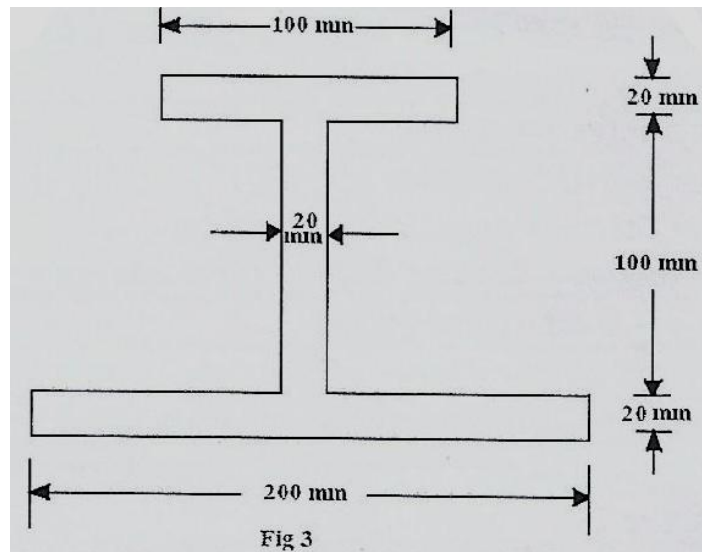
- Q.2 Attempt any four of the following questions. 12**
- a) State and prove the Varignon's theorem.
 - b) State and prove the Lami's theorem
 - c) Enlist different types of supports and explain any two with neat sketches.
 - d) Explain the concept of free body diagram with neat sketch.
 - e) What are the different types of trusses explain any two with neat sketches.
 - f) State and prove parallel axis theorem.
- Q.3 Attempt any two of the following questions. 16**
- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
- State and derive principle of work energy for linear motion
- State and explain principle of conservation of energy.

Q.5 Attempt any two of the following questions.

- a) A stone is dropped into a well is heard to strike the water after 6 seconds. Find depth of well, if the velocity of sound is 350 m/sec.
- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
i) Acceleration of the system
ii) Tension in the string.
Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If gravitational acceleration at any place is doubled then weight of body will be _____.

a) $g/2$	b) g
c) $\sqrt{2}g$	d) $2g$
- 2) In a rectilinear motion all the particles in body _____.

a) have same displacement	b) have some velocity
c) have some acceleration	d) all of these
- 3) D'Alembert's principle correlates _____.

a) force, mass, velocity, and displacement
b) force, mass, and acceleration
c) force, time, mass and velocity
d) mass and velocity
- 4) Angular momentum is the product of _____.

a) mass moment of inertia x angular velocity
b) mass moment of inertia x angular acceleration
c) mass normal of inertia x angular displacement
d) none of these
- 5) The time rate of doing work is known as _____.

a) potential energy	b) kinetic energy
c) rotational energy	d) power
- 6) The bodies which regains their size and shape after impact are called _____.

a) plastic bodies	b) rigid bodies
c) elastic bodies	d) partially plastic bodied

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS**

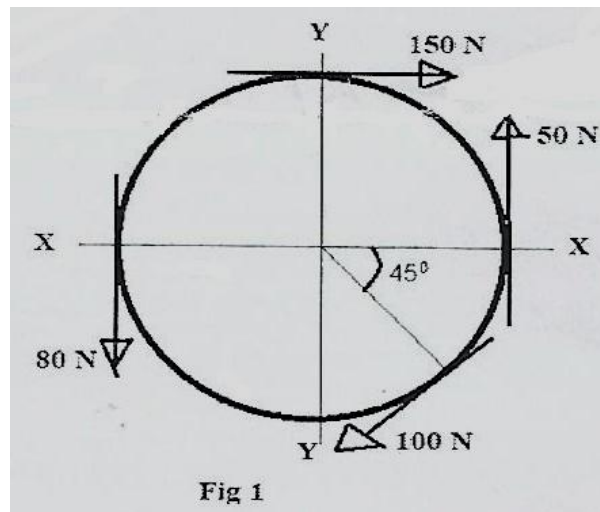
Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

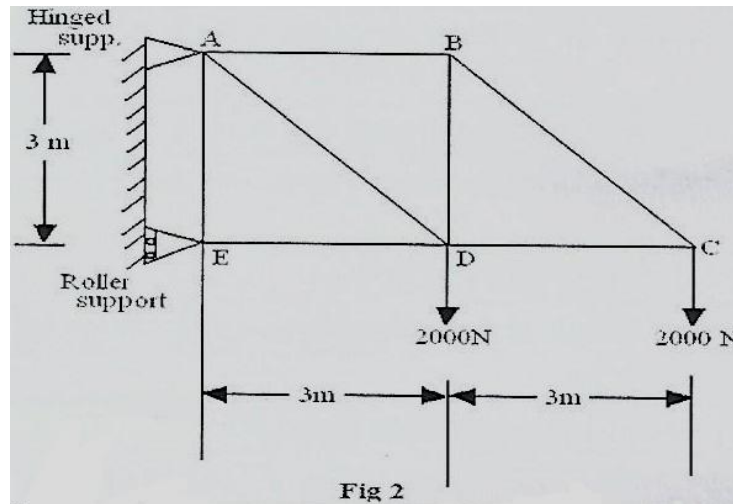
- Instructions:**
- 1) All questions are compulsory.
 - 2) Use of non programmable scientific calculator allowed.
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Section – I

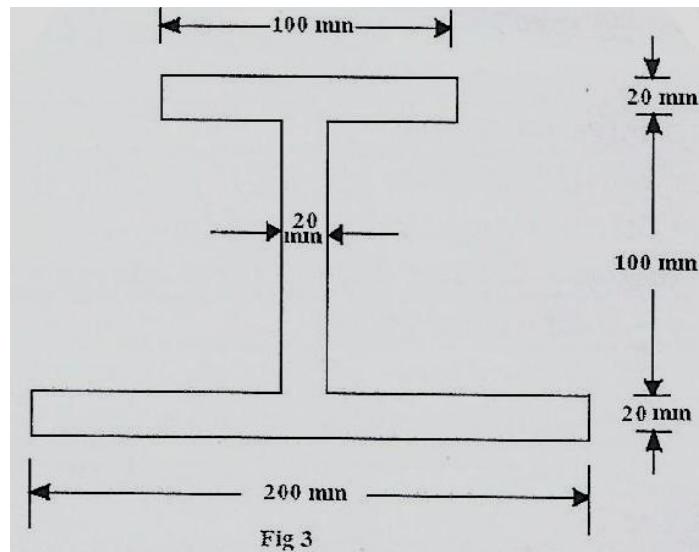
- Q.2 Attempt any four of the following questions. 12**
- a) State and prove the Varignon's theorem.
 - b) State and prove the Lami's theorem
 - c) Enlist different types of supports and explain any two with neat sketches.
 - d) Explain the concept of free body diagram with neat sketch.
 - e) What are the different types of trusses explain any two with neat sketches.
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- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
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- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
i) Acceleration of the system
ii) Tension in the string.
Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) A framed structure of triangular shape is _____.

a) perfect	b) imperfect
c) deficient	d) redundant

- 2) The geometrical center of lamina through which all area is supposed to be acting is called as _____.

a) center of gravity	b) center of mass
c) center of inertia	d) centroid

- 3) The M.I of a triangular section of base (b) & height (h) about on axis through it's base is given as _____.

a) $bh^3/12$	b) $bh^3/18$
c) $bh^3/36$	d) $bh^3/64$

- 4) If gravitational acceleration at any place is doubled then weight of body will be _____.

a) $g/2$	b) g
c) $\sqrt{2}g$	d) $2g$

- 5) In a rectilinear motion all the particles in body _____.

a) have same displacement	b) have some velocity
c) have some acceleration	d) all of these

- 6) D'Alembert's principle correlates _____.

a) force, mass, velocity, and displacement	b) force, mass, and acceleration
c) force, time, mass and velocity	d) mass and velocity

- 7) Angular momentum is the product of _____.
a) mass moment of inertia x angular velocity
b) mass moment of inertia x angular acceleration
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d) none of these
- 8) The time rate of doing work is known as _____.
a) potential energy
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c) rotational energy
d) power
- 9) The bodies which regains their size and shape after impact are called _____.
a) plastic bodies
b) rigid bodies
c) elastic bodies
d) partially plastic bodied
- 10) Impulse is measured in _____.
a) N – sec
b) N /sec
c) N/ sec²
d) N
- 11) Composition of forces is nothing but _____.
a) splitting of forces
b) finding resultant forces
c) both a & b are correct
d) none of these
- 12) 1 Kg force is equal to _____.
a) 7.5 N
b) 8.91 N
c) 9.81 N
d) 8.55 N
- 13) Angle made by resultant of normal reaction and frictional force with vertical is called as _____.
a) angle of friction
b) angle of repose
c) both a & b
d) cone of friction
- 14) A couple produces _____.
a) translatory motion
b) rotational motion
c) both translation & rotation
d) no motion

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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS**

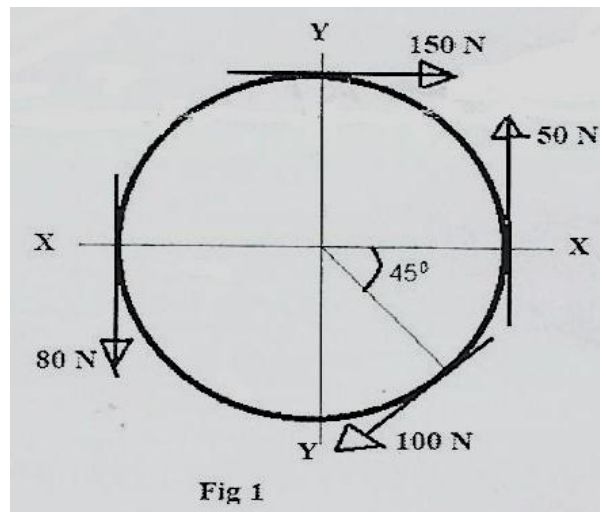
Day & Date: Monday, 09-12-2019
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Max. Marks: 56

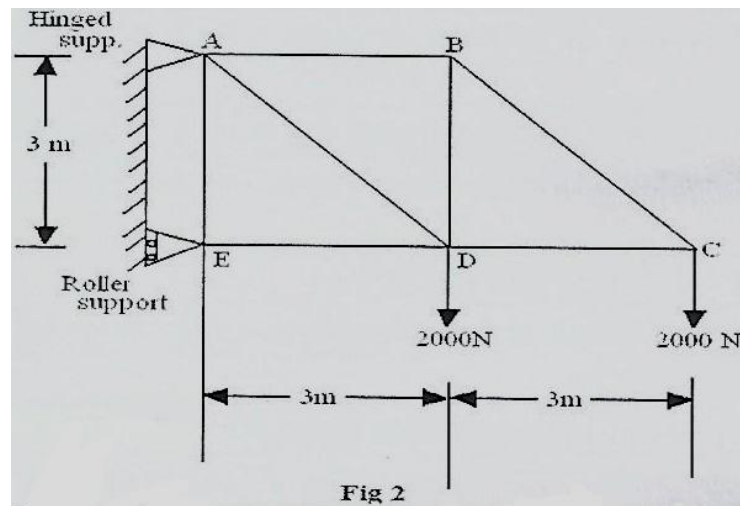
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Section – I

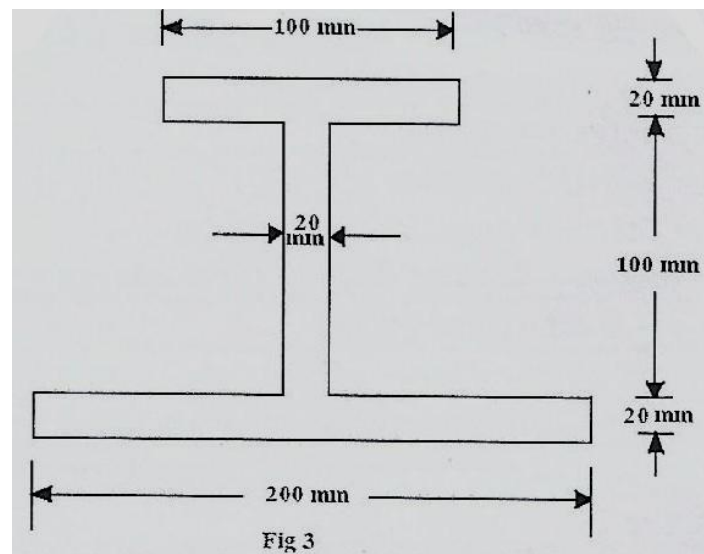
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 - b) State and prove the Lami's theorem
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Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
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- a) A stone is dropped into a well is heard to strike the water after 6 seconds. Find depth of well, if the velocity of sound is 350 m/sec.
- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
i) Acceleration of the system
ii) Tension in the string.
Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) D'Alembert's principle correlates _____.
 - a) force, mass, velocity, and displacement
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- 2) Angular momentum is the product of _____.
 - a) mass moment of inertia x angular velocity
 - b) mass moment of inertia x angular acceleration
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 - d) none of these

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c) elastic bodies	d) partially plastic bodied

- 5) Impulse is measured in _____.

a) N – sec	b) N /sec
c) N/ sec ²	d) N

- 6) Composition of forces is nothing but _____.

a) splitting of forces	b) finding resultant forces
c) both a & b are correct	d) none of these

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS**

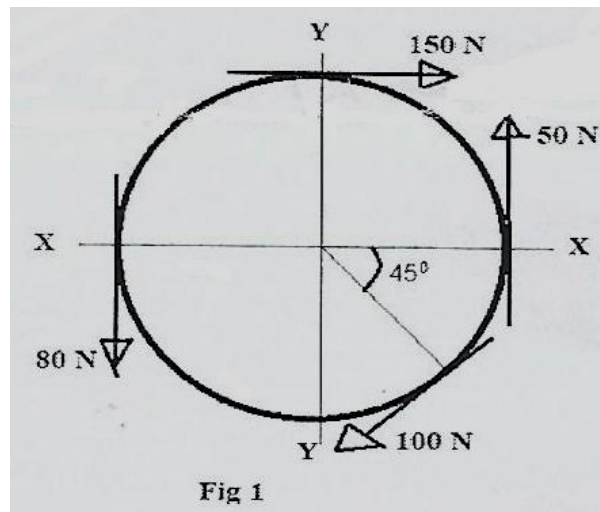
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Max. Marks: 56

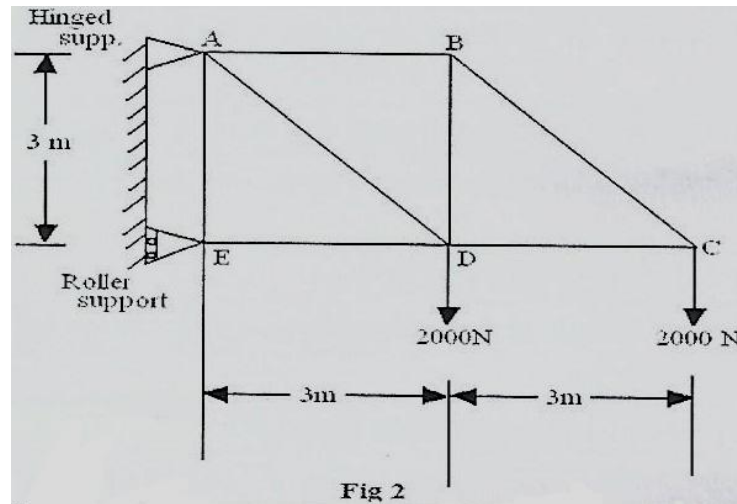
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Section – I

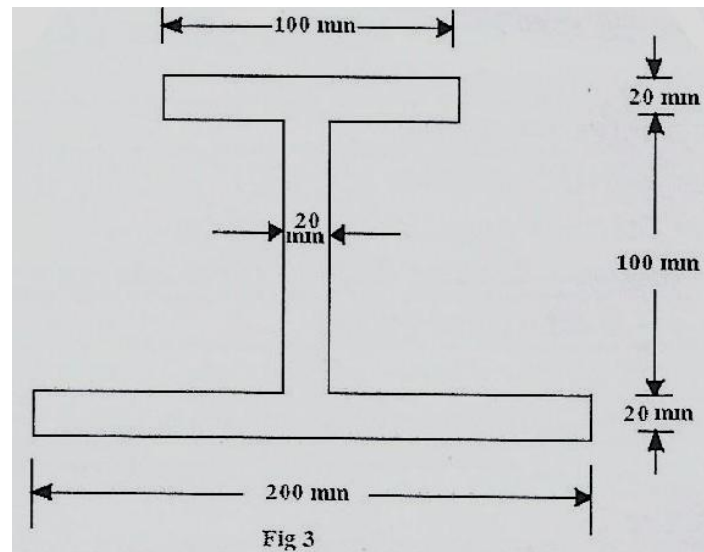
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- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

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- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
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ii) Tension in the string.
Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Assume suitable data if necessary and mention it clearly.
3) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If a network does not contain any energy source is called as _____.
a) Bilateral network b) Unilateral network
c) Active network d) Passive network
- 2) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.
a) 80 b) 77
c) 77.5 d) 100
- 3) Joule's law of electrical heating is given by _____.
a) $H = I^2 R t / J$ b) $H = I R t / J$
c) $H = I^2 R / t J$ d) $H = I^2 J / R t$
- 4) A 25 W, 220V bulb and a 100 W, 220V bulb are joined in parallel and connected to 220V supply. Which bulb will glow more brightly?
a) 25 W bulb
b) 100 W bulb
c) Both will glow with same brightness
d) Neither bulb will glow
- 5) The value of magnetic field strength required to wipe out the residual flux density is called as _____.
a) Retentivity b) Demagnetization
c) Coercive force d) Hysteresis loop
- 6) If a sinusoidal wave has a frequency of 50Hz with 15 A rms value. Which of the following equations represent this wave?
a) $15 \sin 50 t$ b) $30 \sin 314 t$
c) $42.42 \sin 314 t$ d) $21.21 \sin 314 t$
- 7) Average value of full cycle of symmetrical AC waveform is _____.
a) one b) 0.637
c) zero d) 0.707
- 8) The impedance of purely capacitive circuit is given by _____.
a) $z = R - jX_c$ b) $z = R + jX_c$
c) $z = -jX_c$ d) $z = R$

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

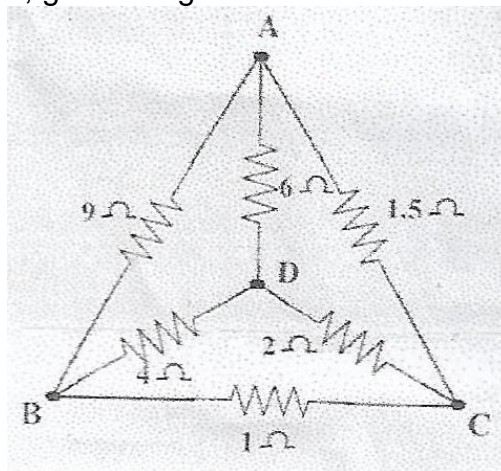
Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicates full marks.

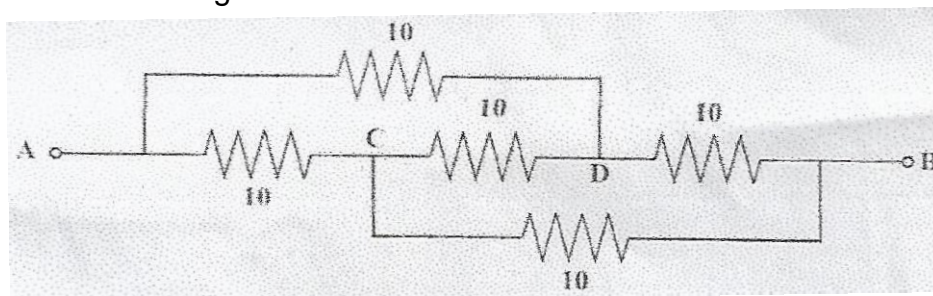
Section – I

Q.2 Answer any four.**16**

- a) A tungsten lamp filament has a temperature of 2050°C and a resistance of 500Ω when taking normal working current. Calculate the resistance of the filament when it has a temperature of 25°C . Temperature coefficient at 0°C is $0.005/^{\circ}\text{C}$.
- b) Define following terms:
1) Cycle
2) Time period
3) Frequency
- c) Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- d) Derive an expression for rms value of an AC quantity.
- e) Find R_{AB} in the circuit, given in fig

**Q.3 Attempt any two.****12**

- a) Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
- c) Three voltages are represented by $e_1 = 20 \sin(\omega t)$; $e_2 = 30 \sin(\omega t - \pi/4)$; $e_3 = 40 \cos(\omega t + \pi/6)$ volts act together in a circuit. Find an expression for the resultant voltage. Draw phasor diagram for $(e_1 + e_2 + e_3)$

Section – II

Q.4 Attempt any four.

16

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
 - 2) Resistance of the coil
 - 3) Inductance of the coil.
- c) Derive the relation between line and phase voltages & currents in balanced delta connected 3-phase load.
- d) Derive an expression for induced emf in a transformer in terms of frequency, maximum flux and the number of turns on the winding.
- e) A single phase, 50Hz transformer has 1000 primary turns and 400 secondary turns. The net cross-sectional area of the core is 60 cm^2 . If the primary induced EMF is 1250V, Find
- 1) Maximum flux density in the core
 - 2) emf induced in the secondary

Q.5 Attempt any two.

12

- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
- 1) Efficiency at full load, 0.8 lagging p.f
 - 2) KVA supplied at maximum efficiency
 - 3) Maximum efficiency at 0.8 lagging p.f
- b) Discuss the different types of DC motor with suitable circuit diagram, voltage equation and applications.
- c) A choking coil and a pure resistor are connected in series across a supply of 230 V, 50 Hz. The voltage drop across the resistor is 100 V and that across the choking coil is 150 V. Find voltage drop across the inductance and resistance of the choking coil. Find resistance & Inductance if current is 1 A.

Seat No.	
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Set **Q**

F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
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3) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The impedance of purely capacitive circuit is given by _____.

a) $z = R - jX_c$	b) $z = R + jX_c$
c) $z = -jX_c$	d) $z = R$
- 2) The average power in R-L series circuit is given by _____.

a) $V_{rms} I_{rms} \cos \phi$	b) $V_{rms} I_{rms}$
c) Zero	d) $V_{rms} I_{rms} \sin \phi$
- 3) Three identical resistances connected in star consume 4000w. If these three resistances are connected in delta across the same supply, the power consumed will be _____.

a) 4000W	b) 6000W
c) 8000W	d) 12000W
- 4) For a balanced three phase system the total power consumed is given by _____.

a) $\sqrt{3} V_{ph} I_{ph} \cos \phi$	b) $V_{ph} I_{ph} \cos \phi$
c) $\sqrt{3} V_{LL} I_{LL} \cos \phi$	d) $3 V_{LL} I_{LL} \cos \phi$
- 5) The emf induced in a transformer depends upon _____.

a) Frequency	b) Number of turns
c) Maximum flux	d) All the above
- 6) A 2000/200V, 20 KVA ideal transformer has 66 turns in the secondary. The number of primary turns is _____.

a) 440	b) 660
c) 550	d) 330
- 7) When the load is removed the motor that will run at the highest speed is the _____.

a) Shunt	b) Series
c) Cumulative compound	d) Differentially compound
- 8) If a network does not contain any energy source is called as _____.

a) Bilateral network	b) Unilateral network
c) Active network	d) Passive network
- 9) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.

a) 80	b) 77
c) 77.5	d) 100

- 10) Joule's law of electrical heating is given by _____.
a) $H = I^2 R t / J$ b) $H = I R t / J$
c) $H = I^2 R / t J$ d) $H = I^2 J / R t$
- 11) A 25 W, 220V bulb and a 100 W. 220V bulb are joined in parallel and connected to 220V supply. Which bulb will glow more brightly?
a) 25 W bulb
b) 100 W bulb
c) Both will glow with same brightness
d) Neither bulb will glow
- 12) The value of magnetic field strength required to wipe out the residual flux density is called as _____.
a) Retentivity b) Demagnetization
c) Coercive force d) Hysteresis loop
- 13) If a sinusoidal wave has a frequency of 50Hz with 15 A rms value. Which of the following equations represent this wave?
a) $15 \sin 50 t$ b) $30 \sin 314 t$
c) $42.42 \sin 314 t$ d) $21.21 \sin 314 t$
- 14) Average value of full cycle of symmetrical AC waveform is _____.
a) one b) 0.637
c) zero d) 0.707

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

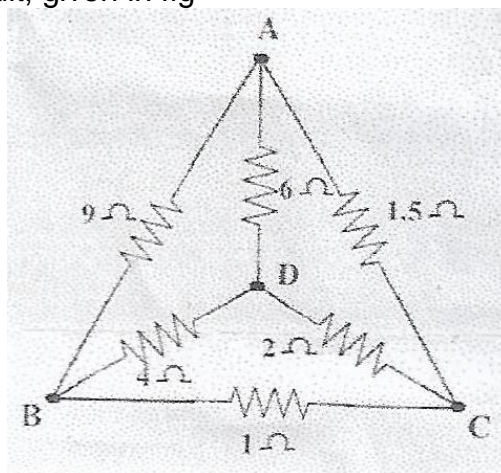
- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicates full marks.

Section – I

Q.2 Answer any four.

16

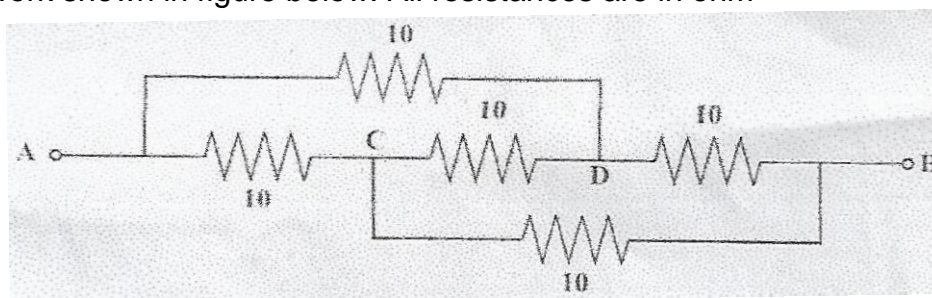
- a) A tungsten lamp filament has a temperature of 2050°C and a resistance of 500Ω when taking normal working current. Calculate the resistance of the filament when it has a temperature of 25°C. Temperature coefficient at 0°C is 0.005/°C.
- b) Define following terms:
 - 1) Cycle
 - 2) Time period
 - 3) Frequency
- c) Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- d) Derive an expression for rms value of an AC quantity.
- e) Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

- a) Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
- c) Three voltages are represented by $e_1 = 20 \sin(\omega t)$; $e_2 = 30 \sin(\omega t - \pi/4)$; $e_3 = 40 \cos(\omega t + \pi/6)$ volts act together in a circuit. Find an expression for the resultant voltage. Draw phasor diagram for $(e_1 + e_2 + e_3)$

Section – II

Q.4 Attempt any four.

16

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
 - 2) Resistance of the coil
 - 3) Inductance of the coil.
- c) Derive the relation between line and phase voltages & currents in balanced delta connected 3-phase load.
- d) Derive an expression for induced emf in a transformer in terms of frequency, maximum flux and the number of turns on the winding.
- e) A single phase, 50Hz transformer has 1000 primary turns and 400 secondary turns. The net cross-sectional area of the core is 60 cm^2 . If the primary induced EMF is 1250V, Find
- 1) Maximum flux density in the core
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Q.5 Attempt any two.

12

- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
- 1) Efficiency at full load, 0.8 lagging p.f
 - 2) KVA supplied at maximum efficiency
 - 3) Maximum efficiency at 0.8 lagging p.f
- b) Discuss the different types of DC motor with suitable circuit diagram, voltage equation and applications.
- c) A choking coil and a pure resistor are connected in series across a supply of 230 V, 50 Hz. The voltage drop across the resistor is 100 V and that across the choking coil is 150 V. Find voltage drop across the inductance and resistance of the choking coil. Find resistance & Inductance if current is 1 A.

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Assume suitable data if necessary and mention it clearly.
3) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The value of magnetic field strength required to wipe out the residual flux density is called as _____.
 - a) Retentivity
 - b) Demagnetization
 - c) Coercive force
 - d) Hysteresis loop
- 2) If a sinusoidal wave has a frequency of 50Hz with 15 A rms value. Which of the following equations represent this wave?
 - a) $15 \sin 50 t$
 - b) $30 \sin 314 t$
 - c) $42.42 \sin 314 t$
 - d) $21.21 \sin 314 t$
- 3) Average value of full cycle of symmetrical AC waveform is _____.
 - a) one
 - b) 0.637
 - c) zero
 - d) 0.707
- 4) The impedance of purely capacitive circuit is given by _____.
 - a) $z = R - jX_c$
 - b) $z = R + jX_c$
 - c) $z = -jX_c$
 - d) $z = R$
- 5) The average power in R-L series circuit is given by _____.
 - a) $V_{rms} I_{rms} \cos \phi$
 - b) $V_{rms} I_{rms}$
 - c) Zero
 - d) $V_{rms} I_{rms} \sin \phi$
- 6) Three identical resistances connected in star consume 4000w. If these three resistances are connected in delta across the same supply, the power consumed will be _____.
 - a) 4000W
 - b) 6000W
 - c) 8000W
 - d) 12000W
- 7) For a balanced three phase system the total power consumed is given by _____.
 - a) $\sqrt{3} V_{ph} I_{ph} \cos \phi$
 - b) $V_{ph} I_{ph} \cos \phi$
 - c) $\sqrt{3} V_{LL} I_{LL} \cos \phi$
 - d) $3 V_{LL} I_{LL} \cos \phi$
- 8) The emf induced in a transformer depends upon _____.
 - a) Frequency
 - b) Number of turns
 - c) Maximum flux
 - d) All the above
- 9) A 2000/200V, 20 KVA ideal transformer has 66 turns in the secondary. The number of primary turns is _____.
 - a) 440
 - b) 660
 - c) 550
 - d) 330

- 10) When the load is removed the motor that will run at the highest speed is the _____.
- | | |
|------------------------|----------------------------|
| a) Shunt | b) Series |
| c) Cumulative compound | d) Differentially compound |
- 11) If a network does not contain any energy source is called as _____.
- | | |
|----------------------|-----------------------|
| a) Bilateral network | b) Unilateral network |
| c) Active network | d) Passive network |
- 12) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.
- | | |
|---------|--------|
| a) 80 | b) 77 |
| c) 77.5 | d) 100 |
- 13) Joule's law of electrical heating is given by _____.
- | | |
|------------------|------------------|
| a) $H = I^2Rt/J$ | b) $H = IRt/J$ |
| c) $H = I^2R/tJ$ | d) $H = I^2J/Rt$ |
- 14) A 25 W, 220V bulb and a 100 W. 220V bulb are joined in parallel and connected to 220V supply. Which bulb will glow more brightly?
- a) 25 W bulb
 - b) 100 W bulb
 - c) Both will glow with same brightness
 - d) Neither bulb will glow

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

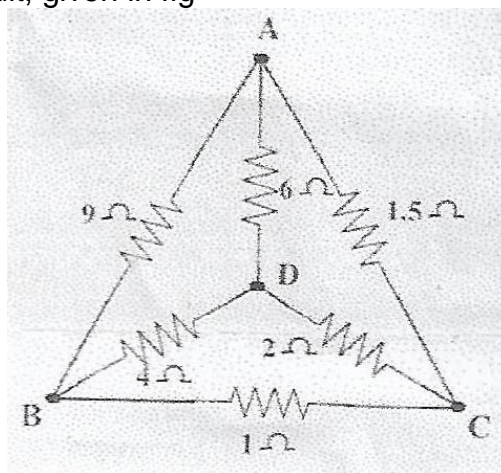
- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicates full marks.

Section – I

Q.2 Answer any four.

16

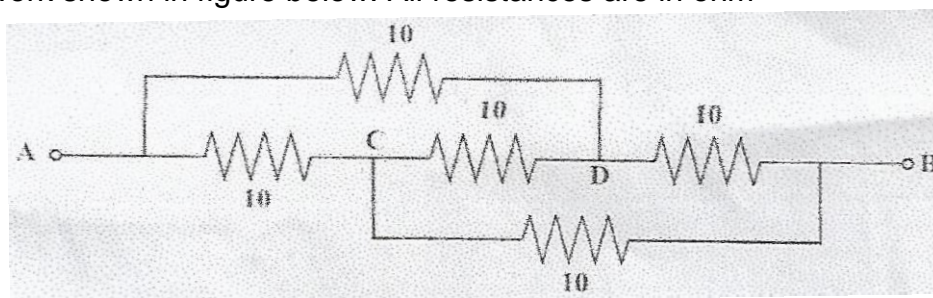
- A tungsten lamp filament has a temperature of 2050°C and a resistance of 500Ω when taking normal working current. Calculate the resistance of the filament when it has a temperature of 25°C. Temperature coefficient at 0°C is 0.005/°C.
- Define following terms:
 - Cycle
 - Time period
 - Frequency
- Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- Derive an expression for rms value of an AC quantity.
- Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

- Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
- c) Three voltages are represented by $e_1 = 20 \sin(\omega t)$; $e_2 = 30 \sin(\omega t - \pi/4)$; $e_3 = 40 \cos(\omega t + \pi/6)$ volts act together in a circuit. Find an expression for the resultant voltage. Draw phasor diagram for $(e_1 + e_2 + e_3)$

Section – II

Q.4 Attempt any four. **16**

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
 - 2) Resistance of the coil
 - 3) Inductance of the coil.
- c) Derive the relation between line and phase voltages & currents in balanced delta connected 3-phase load.
- d) Derive an expression for induced emf in a transformer in terms of frequency, maximum flux and the number of turns on the winding.
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- 1) Maximum flux density in the core
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Q.5 Attempt any two. **12**

- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
- 1) Efficiency at full load, 0.8 lagging p.f
 - 2) KVA supplied at maximum efficiency
 - 3) Maximum efficiency at 0.8 lagging p.f
- b) Discuss the different types of DC motor with suitable circuit diagram, voltage equation and applications.
- c) A choking coil and a pure resistor are connected in series across a supply of 230 V, 50 Hz. The voltage drop across the resistor is 100 V and that across the choking coil is 150 V. Find voltage drop across the inductance and resistance of the choking coil. Find resistance & Inductance if current is 1 A.

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Three identical resistances connected in star consume 4000w. If these three resistances are connected in delta across the same supply, the power consumed will be _____.
 - a) 4000W
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 - d) 12000W
- 2) For a balanced three phase system the total power consumed is given by _____.
 - a) $\sqrt{3} V_{ph} I_{ph} \cos \phi$
 - b) $V_{ph} I_{ph} \cos \phi$
 - c) $\sqrt{3} V_L I_L \cos \phi$
 - d) $3 V_L I_L \cos \phi$
- 3) The emf induced in a transformer depends upon _____.
 - a) Frequency
 - b) Number of turns
 - c) Maximum flux
 - d) All the above
- 4) A 2000/200V, 20 KVA ideal transformer has 66 turns in the secondary. The number of primary turns is _____.
 - a) 440
 - b) 660
 - c) 550
 - d) 330
- 5) When the load is removed the motor that will run at the highest speed is the _____.
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 - c) Cumulative compound
 - d) Differentially compound
- 6) If a network does not contain any energy source is called as _____.
 - a) Bilateral network
 - b) Unilateral network
 - c) Active network
 - d) Passive network
- 7) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.
 - a) 80
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- 8) Joule's law of electrical heating is given by _____.
 - a) $H = I^2 R t / J$
 - b) $H = I R t / J$
 - c) $H = I^2 R / t J$
 - d) $H = I^2 J / R t$

- 9) A 25 W, 220V bulb and a 100 W, 220V bulb are joined in parallel and connected to 220V supply. Which bulb will glow more brightly?
- 25 W bulb
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 - Both will glow with same brightness
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 - $z = -jX_c$
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- 14) The average power in R-L series circuit is given by _____.
- $V_{rms} I_{rms} \cos \phi$
 - $V_{rms} I_{rms}$
 - Zero
 - $V_{rms} I_{rms} \sin \phi$

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

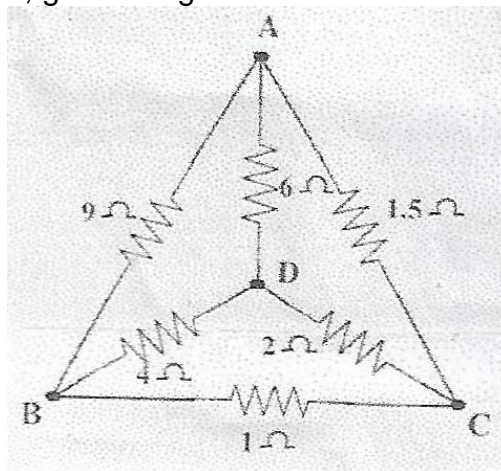
- Instructions:** 1) All questions are compulsory.
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Section – I

Q.2 Answer any four.

16

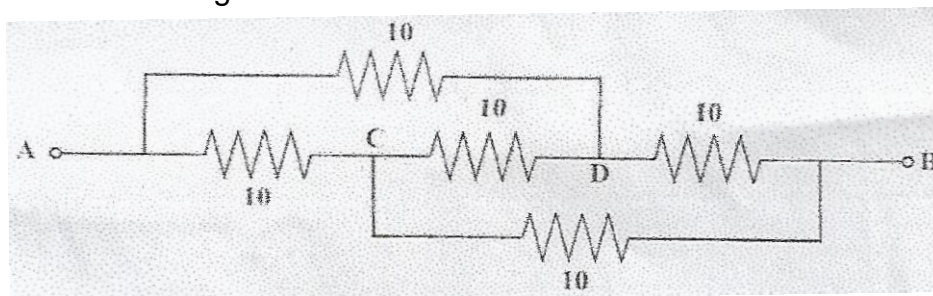
- A tungsten lamp filament has a temperature of 2050°C and a resistance of 500Ω when taking normal working current. Calculate the resistance of the filament when it has a temperature of 25°C . Temperature coefficient at 0°C is $0.005/^{\circ}\text{C}$.
- Define following terms:
 - Cycle
 - Time period
 - Frequency
- Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- Derive an expression for rms value of an AC quantity.
- Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

- Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
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Section – II

Q.4 Attempt any four. **16**

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
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- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
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Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

Day & Date: Friday, 13-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Make suitable assumptions, if necessary and mention them clearly.
3) Figures to the right indicate full marks.
4) Use of log tables and non-programmable single memory calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) During a cycle the heat transfer are given by: 120kJ, -60kJ, -48kJ, and 12kJ the net work transfer the cycle is _____.
 - a) 60000Nm
 - b) 24000Nm
 - c) 12000Nm
 - d) 4400Nm
- 2) In a refrigeration cycle the heat is rejected by a refrigerant in a _____.
 - a) Evaporator
 - b) Condensor
 - c) Compressor
 - d) Expansion valve
- 3) Area under the curve of PV diagram is _____.
 - a) Entropy
 - b) Heat
 - c) Work
 - d) Pressure
- 4) It is amount of heat required per kg of substance for phase transformation - keeping temperature and pressure constant.
 - a) Sensible heat
 - b) Latent heat
 - c) Specific heat
 - d) None of these
- 5) According to kinetic theory of gasses _____.
 - a) Temperature should rise during boiling
 - b) Temperature should fall during freezing
 - c) At absolute zero, there is absolutely no vibration of molecules
 - d) All of the above
- 6) During throttling process _____.
 - a) internal energy does not change
 - b) pressure does not change
 - c) entropy does not change
 - d) enthalpy does not change
- 7) For viscous discharge like oil which one pump is used?
 - a) Reciprocating pumps
 - b) Rotary-(Centrifugal) pump
 - c) gear pump
 - d) None

- 8) Draft tube is used for _____.
a) To increase kinetic energy water striking to turbine
b) To decrease pressure energy water leaving tailrace
c) To increase pressure energy water leaving tailrace
d) None of these
- 9) Compression ratio is _____.
a) total volume / swept volume
b) swept volume / total volume
c) swept volume / clearance volume
d) total volume / clearance volume
- 10) Sum of tensions when the belt is running on the pulley is _____.
a) half the initial tension
b) twice the initial tension
c) more than twice the initial tension
d) less than twice the initial tension
- 11) Which of the following is unitless?
a) Stress
b) Strain
c) Young's modulus
d) Shear modulus
- 12) In arc welding, the electric arc is produced between the work & the electrode by _____.
a) current flow
b) voltage difference
c) contact resistance
d) all of these
- 13) Which of the following filler material is used in brazing?
a) Copper alloy
b) lead-tin alloy
c) Both a & b
d) None of these
- 14) The process of removing material from face of work piece is called _____.
a) Chamfering
b) Knurling
c) Turning
d) Facing

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

Day & Date: Friday, 13-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q. No. 2 and Q. No. 4 are shorts answer type question.
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4) Make suitable assumptions, if necessary and mention them clearly.
5) Use of log tables and non-programmable single memory calculator is allowed.

Section – I

Q.2 Answer any five of the following.

15

- State the limitations of First law of thermodynamics.
- What are the functions of following unit in thermal power plant?
 - Condenser
 - Economizer
 - Cooling tower
 - Air preheater
- Draw neat sketch of split air conditioner. State function of outside unit.
- Explain in detail Kaplan turbine.
- Explain working of lobe blower with neat sketch.
- By applying SFEE, derive an expression for velocity of fluid at the exit of nozzle.
- A closed system undergoes a thermodynamic cycle consisting of 4 processes. The following data gives the work and heat transfer for each of the process.

Process	Heat transfer in kJ/min	Work transfer in kJ/min
1 - 2	Nil	-10000
2 - 3	10000	Nil
3 - 4	-2000	14000
4 - 1	-6000	-2000

Show that the data is consistent with first law of thermodynamics and determine internal energy change for each process.

Q.3 Solve any one out of a) and b) and solve any two out of c) to f).

13

- A gas turbine was operated with a supply of 17 Kg of hot air per second with specific enthalpy of 1200KJ. The outgoing gas carries specific enthalpy of 360 KJ. The inlet and outlet velocities are 160 m/s and 50 m/s. Find the power developed by the turbine assuming heat carried away by cooling water = 2 KJ/sec. **05**
- 0.2 m³ of mixture of air and fuel at 1.2 bar and 60°C is compressed until its pressure becomes 12 bar according to law $pV^{1.25} = C$ then it is ignited at constant volume such that pressure becomes twice to that at the end of compression. Determine: **05**
 - Maximum temp
 - Overall Work done

- | | | |
|-----------|--|-----------|
| c) | Draw a neat sketch of steam power plant. Explain function of air-pre heater economiser and super heater. | 04 |
| d) | How pumps are classified? Explain with the neat sketch the working centrifugal pump. | 04 |
| e) | Derive an expression of work done for polytropic process. | 04 |
| f) | Explain in brief point function and path function with suitable examples. | 04 |

Section – II

Q.4 Solve any five out of seven. **15**

- | | | |
|-----------|---|--|
| a) | Derive an expression for a thermal efficiency of Diesel cycle. | |
| b) | Differentiate between two stroke and four stroke engine. | |
| c) | Derive an expression for the speed ratio of a belt drive assuming thickness of belt. | |
| d) | Which are the different types of gears used in mechanical power transmission system? Explain Bevel gear and Worm and Worm wheel gear. | |
| e) | Draw block diagram of lathe machine. Explain turning operation in short. | |
| f) | Explain stepwise design process of any mechanical component. | |
| g) | Differentiate between soldering and brazing. | |

Q.5 Solve any one out of a) and b) and solve any two out of c) to f). **13**

- | | | |
|-----------|---|-----------|
| a) | An engine working on Otto cycle has total volume of a 0.45m^3 , pressure 1bar and temperature 27°C at the beginning of compression stroke. At the end of compression stroke the pressure is 11bar and 210KJ of heat is added at constant volume. Calculate. | 05 |
| | 1) The pressure, temperature and volume at the salient point in the cycle | |
| | 2) Work done | |
| b) | A cross belt connects two pulleys of 50 cm and 90 cm radius. The distance between shafts is 2 m. The initial tension in the belt is 700 N. If the coefficient of friction between belt and pulley is 0.3. Find the power transmitted if the smaller pulley rotates at 800 rpm. Also calculate the length of the belt. | 05 |
| c) | Sketch and describe in brief pillar drilling machine. | 04 |
| d) | Define factor of safety and explain the different modes of failure of mechanical components. | 04 |
| e) | Explain with neat sketch oxyacetylene welding. | 04 |
| f) | Explain Aesthetic considerations in design. | 04 |

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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

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Time: 10:00 AM To 01:00 PM

Max. Marks: 70

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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Draft tube is used for _____.
 - a) To increase kinetic energy water striking to turbine
 - b) To decrease pressure energy water leaving tailrace
 - c) To increase pressure energy water leaving tailrace
 - d) None of these
- 2) Compression ratio is _____.
 - a) total volume / swept volume
 - b) swept volume / total volume
 - c) swept volume / clearance volume
 - d) total volume / clearance volume
- 3) Sum of tensions when the belt is running on the pulley is _____.
 - a) half the initial tension
 - b) twice the initial tension
 - c) more than twice the initial tension
 - d) less than twice the initial tension
- 4) Which of the following is unitless?

a) Stress	b) Strain
c) Young's modulus	d) Shear modulus
- 5) In arc welding, the electric arc is produced between the work & the electrode by _____.

a) current flow	b) voltage difference
c) contact resistance	d) all of these
- 6) Which of the following filler material is used in brazing?

a) Copper alloy	b) lead-tin alloy
c) Both a & b	d) None of these
- 7) The process of removing material from face of work piece is called _____.

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 - c) gear pump
 - d) None

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING

Day & Date: Friday, 13-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

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Section – I

Q.2 Answer any five of the following.

15

- a) State the limitations of First law of thermodynamics.
- b) What are the functions of following unit in thermal power plant?
 - 1) Condenser
 - 2) Economizer
 - 3) Cooling tower
 - 4) Air preheater
- c) Draw neat sketch of split air conditioner. State function of outside unit.
- d) Explain in detail Kaplan turbine.
- e) Explain working of lobe blower with neat sketch.
- f) By applying SFEE, derive an expression for velocity of fluid at the exit of nozzle.
- g) A closed system undergoes a thermodynamic cycle consisting of 4 processes. The following data gives the work and heat transfer for each of the process.

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Show that the data is consistent with first law of thermodynamics and determine internal energy change for each process.

Q.3 Solve any one out of a) and b) and solve any two out of c) to f).

13

- a) A gas turbine was operated with a supply of 17 Kg of hot air per second with specific enthalpy of 1200KJ. The outgoing gas carries specific enthalpy of 360 KJ. The inlet and outlet velocities are 160 m/s and 50 m/s. Find the power developed by the turbine assuming heat carried away by cooling water = 2 KJ/sec. **05**
- b) 0.2 m³ of mixture of air and fuel at 1.2 bar and 60°C is compressed until its pressure becomes 12 bar according to law $pV^{1.25} = C$ then it is ignited at constant volume such that pressure becomes twice to that at the end of compression. Determine: **05**
 - 1) Maximum temp
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- | | | |
|--|---|----|
| | c) Draw a neat sketch of steam power plant. Explain function of air-pre heater economiser and super heater. | 04 |
| | d) How pumps are classified? Explain with the neat sketch the working centrifugal pump. | 04 |
| | e) Derive an expression of work done for polytropic process. | 04 |
| | f) Explain in brief point function and path function with suitable examples. | 04 |

Section – II

- | | | |
|------------|--|-----------|
| Q.4 | Solve any five out of seven. | 15 |
| | a) Derive an expression for a thermal efficiency of Diesel cycle. | |
| | b) Differentiate between two stroke and four stroke engine. | |
| | c) Derive an expression for the speed ratio of a belt drive assuming thickness of belt. | |
| | d) Which are the different types of gears used in mechanical power transmission system? Explain Bevel gear and Worm and Worm wheel gear. | |
| | e) Draw block diagram of lathe machine. Explain turning operation in short. | |
| | f) Explain stepwise design process of any mechanical component. | |
| | g) Differentiate between soldering and brazing. | |
| Q.5 | Solve any one out of a) and b) and solve any two out of c) to f). | 13 |
| | a) An engine working on Otto cycle has total volume of a 0.45m^3 , pressure 1bar and temperature 27°C at the beginning of compression stroke. At the end of compression stroke the pressure is 11bar and 210KJ of heat is added at constant volume. Calculate. | 05 |
| | 1) The pressure, temperature and volume at the salient point in the cycle | |
| | 2) Work done | |
| | b) A cross belt connects two pulleys of 50 cm and 90 cm radius. The distance between shafts is 2 m. The initial tension in the belt is 700 N. If the coefficient of friction between belt and pulley is 0.3. Find the power transmitted if the smaller pulley rotates at 800 rpm. Also calculate the length of the belt. | 05 |
| | c) Sketch and describe in brief pillar drilling machine. | 04 |
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

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Time: 10:00 AM To 01:00 PM

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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) According to kinetic theory of gasses _____.
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- 14) It is amount of heat required per kg of substance for phase transformation - keeping temperature and pressure constant.
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Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

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Section – I

Q.2 Answer any five of the following.

15

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| | c) Draw a neat sketch of steam power plant. Explain function of air-pre heater economiser and super heater. | 04 |
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Section – II

- | | | |
|------------|--|-----------|
| Q.4 | Solve any five out of seven. | 15 |
| | a) Derive an expression for a thermal efficiency of Diesel cycle. | |
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

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Section – I

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- e) Derive an expression of work done for polytropic process. **04**
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Section – II

Q.4 Solve any five out of seven. **15**

- a) Derive an expression for a thermal efficiency of Diesel cycle.
- b) Differentiate between two stroke and four stroke engine.
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- g) Differentiate between soldering and brazing.

Q.5 Solve any one out of a) and b) and solve any two out of c) to f). **13**

- a) An engine working on Otto cycle has total volume of a 0.45m^3 , pressure 1bar and temperature 27°C at the beginning of compression stroke. At the end of compression stroke the pressure is 11bar and 210KJ of heat is added at constant volume. Calculate. **05**
- 1) The pressure, temperature and volume at the salient point in the cycle
 - 2) Work done
- b) A cross belt connects two pulleys of 50 cm and 90 cm radius. The distance between shafts is 2 m. The initial tension in the belt is 700 N. If the coefficient of friction between belt and pulley is 0.3. Find the power transmitted if the smaller pulley rotates at 800 rpm. Also calculate the length of the belt. **05**
- c) Sketch and describe in brief pillar drilling machine. **04**
- d) Define factor of safety and explain the different modes of failure of mechanical components. **04**
- e) Explain with neat sketch oxyacetylene welding. **04**
- f) Explain Aesthetic considerations in design. **04**

Seat
No.

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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II

Day & Date: Monday, 16-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Question No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26} / \text{K mol}$.

2) $e = 1.6 \times 10^{-19} \text{ C}$

3) $c = 3 \times 10^8 \text{ m/s}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) When a Pure Semi conductor is heated, it's resistance _____.
 - a) Goes up
 - b) Goes down
 - c) Remains the same
 - d) Initially goes down and then goes up
- 2) The relation of angle between axes of a triclinic crystal system is _____.

a) $\alpha = \beta = \gamma = 90^\circ$	b) $\alpha \neq \beta = \gamma = 90^\circ$
c) $\alpha \neq \beta \neq \gamma \neq 90^\circ$	d) $\alpha = \beta = \gamma \neq 90^\circ$
- 3) The miller indices of the plane parallel to the x-axis and y-axis are _____.

a) (100)	b) (010)
c) (001)	d) (111)
- 4) According to Sabine reverberation time is directly proportional to _____.

a) Surface area	b) Volume
c) Absorption coefficient	d) All of the above
- 5) The acoustic diffraction method is used to determine the _____.
 - a) Wavelength of light
 - b) Wavelength of ultra-sonic waves
 - c) Wavelength of acoustic waves
 - d) Velocity of light
- 6) According to Einstein, Velocity of light in free space is _____.
 - a) Depends on direction of propagation
 - b) Variable
 - c) Depends on velocity of source and observer
 - d) A constant
- 7) The length of the rod moving with velocity V relative to the observer is same, when _____.

a) $v = c$	b) $v \ll c$
c) $v \leq c$	d) $v \geq c$

- 8) The resolving power of grating having N slits in n^{th} order will be _____.
- a) $(n + N)$ b) $(n - N)$
c) $n \cdot N$ d) n/N
- 9) Prof. R.N. Hall invented _____ laser.
- a) He-Ne Laser b) CO_2 laser
c) Semiconductor laser d) Nd: YAG laser
- 10) Working principle of laser requires an application of _____ nature of light.
- a) Chemical b) Particle
c) Classical d) Wave
- 11) The optical fibers are based on the principle of _____.
- a) Diffraction b) Reflection
c) Refraction d) Total internal reflection
- 12) The innermost region of optical fiber which guides light is known as _____.
- a) Core b) Clad
c) Sheath d) Coating
- 13) The nuclei suitable for fusion process are _____.
- a) Light nuclei b) Heavy nuclei
c) Any nuclei d) At the middle of periodic table
- 14) The energy released during fission is known as _____.
- a) Chemical energy b) Radiation energy
c) Nuclear energy d) Electrical energy

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) Figures to the right indicate full marks.
2) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26}$ / K mol.
2) $e = 1.6 \times 10^{-19}$ C
3) $c = 3 \times 10^8$ m/s

Section – I

Q.2 Solve any five. **15**

- a) Derive the equation for length contraction.
- b) The hall coefficient (R_H) of a specimen is 3.66×10^{-4} m³/c. Its resistivity is 8.33×10^{-3} Ω m. Find mobility ' μ ' and concentration ' n '
- c) Define the terms.
 - 1) Lattice
 - 2) Basis
 - 3) Unit cell
- d) What is atomic radius? Calculate it for BCC.
- e) A particle is moving with speed of 0.5 c. Calculate the ratio of the rest mass and the mass while in motion.
- f) State essential features of an acoustically good hall.
- g) State properties of ultrasonic waves.

Q.3 Solve any one of the following. **05**

- a) What is Hall effect? Derive an expression for Hall Voltage and Hall Coefficient.

OR

- b) Derive an expression for relativistic variation of mass with velocity.

Q.4 Solve any two **08**

- a) Define Fermi-energy. Derive an expression for Fermi energy in intrinsic semiconductors.
- b) What is atomic packing factor? Calculate it for SC, BCC and FCC.
- c) The volume of a room is 1200m³. The wall area of the room is 220m². The floor area is 120m² and the ceiling area of 120m². The average sound absorption coefficient
 - 1) For walls is 0.03, for ceiling 0.80 and for the floor is 0.06.
 Calculate the average sound absorption coefficient and the reverberation time.

Section – II

Q.5 Solve any five **15**

- a) Distinguish between Fresnel and Fraunhofer diffraction.
- b) A grating of width 2 inch is ruled with 15,000 LPI. Find the smallest wavelength separation that can be resolved in second order at a mean wave length of 5000Å°.

- c) Explain
 - 1) Stimulated absorption
 - 2) Stimulated emission
- d) What are the advantages of optical fiber?
- e) What are the different types of nanotubes? Classify on the basis of chirality.
- f) Determine energy released by 1 kg of U^{235} during the process of nuclear fission by a slow neutron.
- g) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° . Calculate the strength of the solution.

Q.6 Solve any one of the following**05**

- a) Explain the design, working and function of each part of the nuclear fission reactors.

OR

- b) Explain in details the construction, working of He-Ne gas laser. Why middle portion of gas discharge tube is narrow?

Q.7 Solve any two.**08**

- a) Write a note on resolving power of diffraction grating.
- b) Write a note on Semiconductor laser.
- c) Write down classification of different types of nuclear reactors.
- d) Write a note on application of optical fiber in communication system, medical and industrial field.

Seat No.	
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Set **Q**

**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Question No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26} / \text{K mol}$.

2) $e = 1.6 \times 10^{-19} \text{ C}$

3) $c = 3 \times 10^8 \text{ m/s}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) The resolving power of grating having N slits in n^{th} order will be _____.
 - a) $(n + N)$
 - b) $(n - N)$
 - c) $n \cdot N$
 - d) n/N
- 2) Prof. R.N. Hall invented _____ laser.
 - a) He-Ne Laser
 - b) Co_2 laser
 - c) Semiconductor laser
 - d) Nd: YAG laser
- 3) Working principle of laser requires an application of _____ nature of light.
 - a) Chemical
 - b) Particle
 - c) Classical
 - d) Wave
- 4) The optical fibers are based on the principle of _____.
 - a) Diffraction
 - b) Reflection
 - c) Refraction
 - d) Total internal reflection
- 5) The innermost region of optical fiber which guides light is known as _____.
 - a) Core
 - b) Clad
 - c) Sheath
 - d) Coating
- 6) The nuclei suitable for fusion process are _____.
 - a) Light nuclei
 - b) Heavy nuclei
 - c) Any nuclei
 - d) At the middle of periodic table
- 7) The energy released during fission is known as _____.
 - a) Chemical energy
 - b) Radiation energy
 - c) Nuclear energy
 - d) Electrical energy
- 8) When a Pure Semi conductor is heated, it's resistance _____.
 - a) Goes up
 - b) Goes down
 - c) Remains the same
 - d) Initially goes down and then goes up
- 9) The relation of angle between axes of a triclinic crystal system is _____.
 - a) $\alpha = \beta = \gamma = 90^\circ$
 - b) $\alpha \neq \beta = \gamma = 90^\circ$
 - c) $\alpha \neq \beta \neq \gamma \neq 90^\circ$
 - d) $\alpha = \beta = \gamma \neq 90^\circ$

Seat No.	
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Set Q

**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) Figures to the right indicate full marks.
2) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26}$ / K mol.
2) $e = 1.6 \times 10^{-19}$ C
3) $c = 3 \times 10^8$ m/s

Section – I

Q.2 Solve any five. **15**

- a) Derive the equation for length contraction.
- b) The hall coefficient (R_H) of a specimen is 3.66×10^{-4} m³/c. Its resistivity is 8.33×10^{-3} Ω m. Find mobility ' μ ' and concentration ' n '
- c) Define the terms.
 - 1) Lattice
 - 2) Basis
 - 3) Unit cell
- d) What is atomic radius? Calculate it for BCC.
- e) A particle is moving with speed of 0.5 c. Calculate the ratio of the rest mass and the mass while in motion.
- f) State essential features of an acoustically good hall.
- g) State properties of ultrasonic waves.

Q.3 Solve any one of the following. **05**

- a) What is Hall effect? Derive an expression for Hall Voltage and Hall Coefficient.

OR

- b) Derive an expression for relativistic variation of mass with velocity.

Q.4 Solve any two **08**

- a) Define Fermi-energy. Derive an expression for Fermi energy in intrinsic semiconductors.
- b) What is atomic packing factor? Calculate it for SC, BCC and FCC.
- c) The volume of a room is 1200m³. The wall area of the room is 220m². The floor area is 120m² and the ceiling area of 120m². The average sound absorption coefficient
 - 1) For walls is 0.03, for ceiling 0.80 and for the floor is 0.06.
 Calculate the average sound absorption coefficient and the reverberation time.

Section – II

Q.5 Solve any five **15**

- a) Distinguish between Fresnel and Fraunhofer diffraction.
- b) A grating of width 2 inch is ruled with 15,000 LPI. Find the smallest wavelength separation that can be resolved in second order at a mean wave length of 5000Å°.

- c) Explain
 - 1) Stimulated absorption
 - 2) Stimulated emission
- d) What are the advantages of optical fiber?
- e) What are the different types of nanotubes? Classify on the basis of chirality.
- f) Determine energy released by 1 kg of U^{235} during the process of nuclear fission by a slow neutron.
- g) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° . Calculate the strength of the solution.

Q.6 Solve any one of the following**05**

- a) Explain the design, working and function of each part of the nuclear fission reactors.

OR

- b) Explain in details the construction, working of He-Ne gas laser. Why middle portion of gas discharge tube is narrow?

Q.7 Solve any two.**08**

- a) Write a note on resolving power of diffraction grating.
- b) Write a note on Semiconductor laser.
- c) Write down classification of different types of nuclear reactors.
- d) Write a note on application of optical fiber in communication system, medical and industrial field.

Seat No.	
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Set **R**

**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Question No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26} / \text{K mol.}$

2) $e = 1.6 \times 10^{-19} \text{ C}$

3) $c = 3 \times 10^8 \text{ m/s}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) The acoustic diffraction method is used to determine the _____.
 - a) Wavelength of light
 - b) Wavelength of ultra-sonic waves
 - c) Wavelength of acoustic waves
 - d) Velocity of light
- 2) According to Einstein, Velocity of light in free space is _____.
 - a) Depends on direction of propagation
 - b) Variable
 - c) Depends on velocity of source and observer
 - d) A constant
- 3) The length of the rod moving with velocity V relative to the observer is same, when _____.

a) $v = c$	b) $v \ll c$
c) $v \leq c$	d) $v \geq c$
- 4) The resolving power of grating having N slits in n^{th} order will be _____.

a) $(n + N)$	b) $(n - N)$
c) $n.N$	d) n/N
- 5) Prof. R.N. Hall invented _____ laser.

a) He-Ne Laser	b) Co_2 laser
c) Semiconductor laser	d) Nd: YAG laser
- 6) Working principle of laser requires an application of _____ nature of light.

a) Chemical	b) Particle
c) Classical	d) Wave
- 7) The optical fibers are based on the principle of _____.

a) Diffraction	b) Reflection
c) Refraction	d) Total internal reflection
- 8) The innermost region of optical fiber which guides light is known as _____.

a) Core	b) Clad
c) Sheath	d) Coating

- 9) The nuclei suitable for fusion process are _____.
a) Light nuclei b) Heavy nuclei
c) Any nuclei d) At the middle of periodic table
- 10) The energy released during fission is known as _____.
a) Chemical energy b) Radiation energy
c) Nuclear energy d) Electrical energy
- 11) When a Pure Semi conductor is heated, it's resistance _____.
a) Goes up
b) Goes down
c) Remains the same
d) Initially goes down and then goes up
- 12) The relation of angle between axes of a triclinic crystal system is _____.
a) $\alpha = \beta = \gamma = 90^\circ$ b) $\alpha \neq \beta = \gamma = 90^\circ$
c) $\alpha \neq \beta \neq \gamma \neq 90^\circ$ d) $\alpha = \beta = \gamma \neq 90^\circ$
- 13) The miller indices of the plane parallel to the x-axis and y-axis are _____.
a) (100) b) (010)
c) (001) d) (111)
- 14) According to Sabine reverberation time is directly proportional to _____.
a) Surface area b) Volume
c) Absorption coefficient d) All of the above

Seat No.	
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Set **R**

**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) Figures to the right indicate full marks.
2) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26}$ / K mol.
2) $e = 1.6 \times 10^{-19}$ C
3) $c = 3 \times 10^8$ m/s

Section – I

Q.2 Solve any five. **15**

- a) Derive the equation for length contraction.
- b) The hall coefficient (R_H) of a specimen is 3.66×10^{-4} m³/c. Its resistivity is 8.33×10^{-3} Ω m. Find mobility ' μ ' and concentration ' n '
- c) Define the terms.
 - 1) Lattice
 - 2) Basis
 - 3) Unit cell
- d) What is atomic radius? Calculate it for BCC.
- e) A particle is moving with speed of 0.5 c. Calculate the ratio of the rest mass and the mass while in motion.
- f) State essential features of an acoustically good hall.
- g) State properties of ultrasonic waves.

Q.3 Solve any one of the following. **05**

- a) What is Hall effect? Derive an expression for Hall Voltage and Hall Coefficient.

OR

- b) Derive an expression for relativistic variation of mass with velocity.

Q.4 Solve any two **08**

- a) Define Fermi-energy. Derive an expression for Fermi energy in intrinsic semiconductors.
- b) What is atomic packing factor? Calculate it for SC, BCC and FCC.
- c) The volume of a room is 1200m³. The wall area of the room is 220m². The floor area is 120m² and the ceiling area of 120m². The average sound absorption coefficient
 - 1) For walls is 0.03, for ceiling 0.80 and for the floor is 0.06.
 Calculate the average sound absorption coefficient and the reverberation time.

Section – II

Q.5 Solve any five **15**

- a) Distinguish between Fresnel and Fraunhofer diffraction.
- b) A grating of width 2 inch is ruled with 15,000 LPI. Find the smallest wavelength separation that can be resolved in second order at a mean wave length of 5000Å°.

- c) Explain
 - 1) Stimulated absorption
 - 2) Stimulated emission
- d) What are the advantages of optical fiber?
- e) What are the different types of nanotubes? Classify on the basis of chirality.
- f) Determine energy released by 1 kg of U^{235} during the process of nuclear fission by a slow neutron.
- g) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° . Calculate the strength of the solution.

Q.6 Solve any one of the following**05**

- a) Explain the design, working and function of each part of the nuclear fission reactors.

OR

- b) Explain in details the construction, working of He-Ne gas laser. Why middle portion of gas discharge tube is narrow?

Q.7 Solve any two.**08**

- a) Write a note on resolving power of diffraction grating.
- b) Write a note on Semiconductor laser.
- c) Write down classification of different types of nuclear reactors.
- d) Write a note on application of optical fiber in communication system, medical and industrial field.

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Question No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26} / \text{K mol.}$

2) $e = 1.6 \times 10^{-19} \text{ C}$

3) $c = 3 \times 10^8 \text{ m/s}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) Working principle of laser requires an application of _____ nature of light.
 - a) Chemical
 - b) Particle
 - c) Classical
 - d) Wave
- 2) The optical fibers are based on the principle of _____.
 - a) Diffraction
 - b) Reflection
 - c) Refraction
 - d) Total internal reflection
- 3) The innermost region of optical fiber which guides light is known as _____.
 - a) Core
 - b) Clad
 - c) Sheath
 - d) Coating
- 4) The nuclei suitable for fusion process are _____.
 - a) Light nuclei
 - b) Heavy nuclei
 - c) Any nuclei
 - d) At the middle of periodic table
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 - b) Goes down
 - c) Remains the same
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 - b) (010)
 - c) (001)
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 - c) Absorption coefficient
 - d) All of the above

- 10) The acoustic diffraction method is used to determine the _____.
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- 12) The length of the rod moving with velocity V relative to the observer is same, when _____.
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- 13) The resolving power of grating having N slits in n^{th} order will be _____.
- a) $(n + N)$
 - b) $(n - N)$
 - c) $n \cdot N$
 - d) n/N
- 14) Prof. R.N. Hall invented _____ laser.
- a) He-Ne Laser
 - b) CO_2 laser
 - c) Semiconductor laser
 - d) Nd: YAG laser

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING PHYSICS – I & ENGINEERING PHYSICS – II**

Day & Date: Monday, 16-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) Figures to the right indicate full marks.
2) Assume suitable data if necessary.

Constant: 1) $N_A = 6.02 \times 10^{26}$ / K mol.
2) $e = 1.6 \times 10^{-19}$ C
3) $c = 3 \times 10^8$ m/s

Section – I

Q.2 Solve any five. **15**

- a) Derive the equation for length contraction.
- b) The hall coefficient (R_H) of a specimen is 3.66×10^{-4} m³/c. Its resistivity is 8.33×10^{-3} Ω m. Find mobility ' μ ' and concentration ' n '
- c) Define the terms.
 - 1) Lattice
 - 2) Basis
 - 3) Unit cell
- d) What is atomic radius? Calculate it for BCC.
- e) A particle is moving with speed of 0.5 c. Calculate the ratio of the rest mass and the mass while in motion.
- f) State essential features of an acoustically good hall.
- g) State properties of ultrasonic waves.

Q.3 Solve any one of the following. **05**

- a) What is Hall effect? Derive an expression for Hall Voltage and Hall Coefficient.

OR

- b) Derive an expression for relativistic variation of mass with velocity.

Q.4 Solve any two **08**

- a) Define Fermi-energy. Derive an expression for Fermi energy in intrinsic semiconductors.
- b) What is atomic packing factor? Calculate it for SC, BCC and FCC.
- c) The volume of a room is 1200m³. The wall area of the room is 220m². The floor area is 120m² and the ceiling area of 120m². The average sound absorption coefficient
 - 1) For walls is 0.03, for ceiling 0.80 and for the floor is 0.06.
 Calculate the average sound absorption coefficient and the reverberation time.

Section – II

Q.5 Solve any five **15**

- a) Distinguish between Fresnel and Fraunhofer diffraction.
- b) A grating of width 2 inch is ruled with 15,000 LPI. Find the smallest wavelength separation that can be resolved in second order at a mean wave length of 5000Å°.

- c) Explain
 - 1) Stimulated absorption
 - 2) Stimulated emission
- d) What are the advantages of optical fiber?
- e) What are the different types of nanotubes? Classify on the basis of chirality.
- f) Determine energy released by 1 kg of U^{235} during the process of nuclear fission by a slow neutron.
- g) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° . Calculate the strength of the solution.

Q.6 Solve any one of the following**05**

- a) Explain the design, working and function of each part of the nuclear fission reactors.

OR

- b) Explain in details the construction, working of He-Ne gas laser. Why middle portion of gas discharge tube is narrow?

Q.7 Solve any two.**08**

- a) Write a note on resolving power of diffraction grating.
- b) Write a note on Semiconductor laser.
- c) Write down classification of different types of nuclear reactors.
- d) Write a note on application of optical fiber in communication system, medical and industrial field.

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II**

Day & Date: Wednesday, 18-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) Hard water is unfit for use in boilers for steam raising because _____.
 - a) Causes wastage of fuel
 - b) Water undergoes decomposition
 - c) Forms scales inside the boiler
 - d) Both a & c
- 2) Hard water may be softened by passing it through _____.
 - a) Sodium silicate
 - b) Limestone
 - c) Ion exchange resins
 - d) Calcium silicate
- 3) Commonly used disinfectant is _____.
 - a) Chlorine
 - b) Bleaching powder
 - c) Lime
 - d) Both a & b
- 4) Animal and vegetable oils are _____.
 - a) Contains fatty acids
 - b) High viscosity
 - c) Good in oiliness
 - d) All of these
- 5) When graphite is dispersed in oil, it is called as _____.
 - a) Grease
 - b) Blended oil
 - c) Aquadag
 - d) Oil dag
- 6) Metals at the top of electromotive series are _____.
 - a) Least active
 - b) More active
 - c) More stable
 - d) None of these
- 7) Corrosion is an example of _____.
 - a) Oxidation - reduction process
 - b) Electro dialysis process
 - c) Hydrolysis
 - d) Reverse osmosis
- 8) Wrought iron is _____.
 - a) Ductile
 - b) Weldable
 - c) Malleable
 - d) All are correct
- 9) An alloy having high electrical resistance and can be used in heating appliances is _____.
 - a) Durallumin
 - b) Nichrome
 - c) Stainless steel
 - d) Brass
- 10) To get accurate results in Bomb calorimeter experiment which of the following correction is suggested?
 - a) Heating correction
 - b) Alkaline correction
 - c) Cooling correction
 - d) None of these

- 11) Following is not the example of primary fuel _____.
- | | |
|-----------|----------------|
| a) Wood | b) Coal |
| c) Petrol | d) Natural gas |
- 12) Ebonite is _____.
- | | |
|-------------------|-----------------------------|
| a) Polyethylene | b) Highly vulcanized rubber |
| c) Natural rubber | d) Synthetic rubber |
- 13) Which of the following polymer contains nitrogen?
- | | |
|----------|-------------|
| a) Nylon | b) Teflon |
| c) PVC | d) Terylene |
- 14) In TGA curves horizontal portions represents that the compound is thermally _____.
- | | |
|---------------|------------------|
| a) Stable | b) Unstable |
| c) Both a & b | d) None of these |

Seat No.	
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Set **P**

**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II**

Day & Date: Wednesday, 18-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Attempt all questions.
2) Draw neat diagram wherever necessary.
3) Figures to right indicate full marks.

Section – I

Q.2 A) Solve any two. 08

- Describe Boundary (thin film) lubrication.
- Write traditional and greener pathway of synthesis of indigo dye.
- A sample of water on analysis was found to contain following impurities in ppm.

Impurities	Amount (ppm)	Mole. Wt
CaSO ₄	35	136
Ca (HCO ₃) ₂	46	162
MgCl ₂	54	95
CaCl ₂	42	111

Calculate temporary, permanent and total hardness of water sample.

B) Solve any two. 06

- Write any six principles of green chemistry.
- Describe estimation of hardness of water by EDTA method.
- Explain any three factors influencing corrosion of metal.

Q.3 A) Solve any two. 08

- Define corrosion. Explain wet corrosion with O₂ absorption mechanism.
- Explain disinfection of water with chemical reactions.
- Write a note on liquid lubricants.

B) Solve the following. 06

- Describe sacrificial anode method for protection of metal from corrosion.
- In an acid value determination experiment 13.5 gm of oil sample require 7.6 ml of N/10 KOH solution for neutralization to phenolphthalein end point. Calculate the acid value of oil sample. (Mole. Wt of KOH = 56)

Section – II

Q.4 A) Solve any two. 08

- Distinguish between thermosoftening and thermosetting plastics.
- Describe construction and working of Boy's calorimeter.
- Calculate gross and net calorific value of coal having the following composition in percentage, C = 82, H = 5.5, S = 3.5, N = 2.1, O = 3, Ash = 3.2
(Latent Heat of steam = 587 Kcal/kg)

B) Solve any two.

06

- 1) Define:
 - i) Calorific value
 - ii) Molality
 - iii) Mole Fraction
- 2) How the natural rubber can be processed from latex?
- 3) Calculate molality of solution containing 4.9 gm of H_2SO_4 in 1.5 kg water.
(At. Wt.: H= 1, S = 32, O=16)

Q.5 A) Solve any two.

08

- 1) Explain refining of crude oil by fractional distillation.
- 2) Define Alloy. Explain any three purposes of making alloys, Give example of each.
- 3) Compare composition, properties and applications of steel.

B) Solve the following.

06

- 1) Define conducting polymers. Write its applications.
- 2) Calculate number average molecular weight of a polymer having following composition.
5 molecules of molecular weight each 50000 g/mole
15 molecules of molecular weight each 10000 g/mole
20 molecules of molecular weight each 15000 g/mole
10 molecules of molecular weight each 25000 g/mole

OR**Solve the following.**

- 1) Draw block diagram of instrumentation of GLC and write its uses.
- 2) Degree of polymerization of polystyrene is 5000. Calculate molecular weight of polystyrene. (Structure of styrene $\text{C}_6\text{H}_5\text{-CH=CH}_2$)

Seat No.	
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**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II**

Day & Date: Wednesday, 18-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) Wrought iron is _____.
 - a) Ductile
 - b) Weldable
 - c) Malleable
 - d) All are correct
- 2) An alloy having high electrical resistance and can be used in heating appliances is _____.
 - a) Durallumin
 - b) Nichrome
 - c) Stainless steel
 - d) Brass
- 3) To get accurate results in Bomb calorimeter experiment which of the following correction is suggested?
 - a) Heating correction
 - b) Alkaline correction
 - c) Cooling correction
 - d) None of these
- 4) Following is not the example of primary fuel _____.
 - a) Wood
 - b) Coal
 - c) Petrol
 - d) Natural gas
- 5) Ebonite is _____.
 - a) Polyethylene
 - b) Highly vulcanized rubber
 - c) Natural rubber
 - d) Synthetic rubber
- 6) Which of the following polymer contains nitrogen?
 - a) Nylon
 - b) Teflon
 - c) PVC
 - d) Terylene
- 7) In TGA curves horizontal portions represents that the compound is thermally _____.
 - a) Stable
 - b) Unstable
 - c) Both a & b
 - d) None of these
- 8) Hard water is unfit for use in boilers for steam raising because _____.
 - a) Causes wastage of fuel
 - b) Water undergoes decomposition
 - c) Forms scales inside the boiler
 - d) Both a & c
- 9) Hard water may be softened by passing it through _____.
 - a) Sodium silicate
 - b) Limestone
 - c) Ion exchange resins
 - d) Calcium silicate

- 10) Commonly used disinfectant is _____.
a) Chlorine b) Bleaching powder
c) Lime d) Both a & b
- 11) Animal and vegetable oils are _____.
a) Contains fatty acids b) High viscosity
c) Good in oiliness d) All of these
- 12) When graphite is dispersed in oil, it is called as _____.
a) Grease b) Blended oil
c) Aquadag d) Oil dag
- 13) Metals at the top of electromotive series are _____.
a) Least active b) More active
c) More stable d) None of these
- 14) Corrosion is an example of _____.
a) Oxidation - reduction process b) Electro dialysis process
c) Hydrolysis d) Reverse osmosis

Seat No.	
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Set **Q**

F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II

Day & Date: Wednesday, 18-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Attempt all questions.
 2) Draw neat diagram wherever necessary.
 3) Figures to right indicate full marks.

Section – I

Q.2 A) Solve any two. 08

- 1) Describe Boundary (thin film) lubrication.
- 2) Write traditional and greener pathway of synthesis of indigo dye.
- 3) A sample of water on analysis was found to contain following impurities in ppm.

Impurities	Amount (ppm)	Mole. Wt
CaSO ₄	35	136
Ca (HCO ₃) ₂	46	162
MgCl ₂	54	95
CaCl ₂	42	111

Calculate temporary, permanent and total hardness of water sample.

B) Solve any two. 06

- 1) Write any six principles of green chemistry.
- 2) Describe estimation of hardness of water by EDTA method.
- 3) Explain any three factors influencing corrosion of metal.

Q.3 A) Solve any two. 08

- 1) Define corrosion. Explain wet corrosion with O₂ absorption mechanism.
- 2) Explain disinfection of water with chemical reactions.
- 3) Write a note on liquid lubricants.

B) Solve the following. 06

- 1) Describe sacrificial anode method for protection of metal from corrosion.
- 2) In an acid value determination experiment 13.5 gm of oil sample require 7.6 ml of N/10 KOH solution for neutralization to phenolphthalein end point. Calculate the acid value of oil sample. (Mole. Wt of KOH = 56)

Section – II

Q.4 A) Solve any two. 08

- 1) Distinguish between thermosoftening and thermosetting plastics.
- 2) Describe construction and working of Boy's calorimeter.
- 3) Calculate gross and net calorific value of coal having the following composition in percentage, C = 82, H = 5.5, S = 3.5, N = 2.1, O = 3, Ash = 3.2
 (Latent Heat of steam = 587 Kcal/kg)

B) Solve any two.

- 1) Define:
 - i) Calorific value
 - ii) Molality
 - iii) Mole Fraction
- 2) How the natural rubber can be processed from latex?
- 3) Calculate molality of solution containing 4.9 gm of H_2SO_4 in 1.5 kg water.
(At. Wt.: H= 1, S = 32, O=16)

Q.5 A) Solve any two.

- 1) Explain refining of crude oil by fractional distillation.
- 2) Define Alloy. Explain any three purposes of making alloys, Give example of each.
- 3) Compare composition, properties and applications of steel.

B) Solve the following.

- 1) Define conducting polymers. Write its applications.
- 2) Calculate number average molecular weight of a polymer having following composition.
5 molecules of molecular weight each 50000 g/mole
15 molecules of molecular weight each 10000 g/mole
20 molecules of molecular weight each 15000 g/mole
10 molecules of molecular weight each 25000 g/mole

OR

Solve the following.

- 1) Draw block diagram of instrumentation of GLC and write its uses.
- 2) Degree of polymerization of polystyrene is 5000. Calculate molecular weight of polystyrene. (Structure of styrene $C_6H_5-CH=CH_2$)

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II

Day & Date: Wednesday, 18-12-2019

Max. Marks: 70

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) When graphite is dispersed in oil, it is called as _____.
 - a) Grease
 - b) Blended oil
 - c) Aquadag
 - d) Oil dag
- 2) Metals at the top of electromotive series are _____.
 - a) Least active
 - b) More active
 - c) More stable
 - d) None of these
- 3) Corrosion is an example of _____.
 - a) Oxidation - reduction process
 - b) Electro dialysis process
 - c) Hydrolysis
 - d) Reverse osmosis
- 4) Wrought iron is _____.
 - a) Ductile
 - b) Weldable
 - c) Malleable
 - d) All are correct
- 5) An alloy having high electrical resistance and can be used in heating appliances is _____.
 - a) Durallumin
 - b) Nichrome
 - c) Stainless steel
 - d) Brass
- 6) To get accurate results in Bomb calorimeter experiment which of the following correction is suggested?
 - a) Heating correction
 - b) Alkaline correction
 - c) Cooling correction
 - d) None of these
- 7) Following is not the example of primary fuel _____.
 - a) Wood
 - b) Coal
 - c) Petrol
 - d) Natural gas
- 8) Ebonite is _____.
 - a) Polyethylene
 - b) Highly vulcanized rubber
 - c) Natural rubber
 - d) Synthetic rubber
- 9) Which of the following polymer contains nitrogen?
 - a) Nylon
 - b) Teflon
 - c) PVC
 - d) Terylene
- 10) In TGA curves horizontal portions represents that the compound is thermally _____.
 - a) Stable
 - b) Unstable
 - c) Both a & b
 - d) None of these

- 11) Hard water is unfit for use in boilers for steam raising because _____.
a) Causes wastage of fuel
b) Water undergoes decomposition
c) Forms scales inside the boiler
d) Both a & c
- 12) Hard water may be softened by passing it through _____.
a) Sodium silicate b) Limestone
c) Ion exchange resins d) Calcium silicate
- 13) Commonly used disinfectant is _____.
a) Chlorine b) Bleaching powder
c) Lime d) Both a & b
- 14) Animal and vegetable oils are _____.
a) Contains fatty acids b) High viscosity
c) Good in oiliness d) All of these

Seat No.	
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Set **R**

F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II

Day & Date: Wednesday, 18-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Attempt all questions.
 2) Draw neat diagram wherever necessary.
 3) Figures to right indicate full marks.

Section – I

Q.2 A) Solve any two. 08

- 1) Describe Boundary (thin film) lubrication.
- 2) Write traditional and greener pathway of synthesis of indigo dye.
- 3) A sample of water on analysis was found to contain following impurities in ppm.

Impurities	Amount (ppm)	Mole. Wt
CaSO ₄	35	136
Ca (HCO ₃) ₂	46	162
MgCl ₂	54	95
CaCl ₂	42	111

Calculate temporary, permanent and total hardness of water sample.

B) Solve any two. 06

- 1) Write any six principles of green chemistry.
- 2) Describe estimation of hardness of water by EDTA method.
- 3) Explain any three factors influencing corrosion of metal.

Q.3 A) Solve any two. 08

- 1) Define corrosion. Explain wet corrosion with O₂ absorption mechanism.
- 2) Explain disinfection of water with chemical reactions.
- 3) Write a note on liquid lubricants.

B) Solve the following. 06

- 1) Describe sacrificial anode method for protection of metal from corrosion.
- 2) In an acid value determination experiment 13.5 gm of oil sample require 7.6 ml of N/10 KOH solution for neutralization to phenolphthalein end point. Calculate the acid value of oil sample. (Mole. Wt of KOH = 56)

Section – II

Q.4 A) Solve any two. 08

- 1) Distinguish between thermosoftening and thermosetting plastics.
- 2) Describe construction and working of Boy's calorimeter.
- 3) Calculate gross and net calorific value of coal having the following composition in percentage, C = 82, H = 5.5, S = 3.5, N = 2.1, O = 3, Ash = 3.2
 (Latent Heat of steam = 587 Kcal/kg)

B) Solve any two.

06

- 1) Define:
 - i) Calorific value
 - ii) Molality
 - iii) Mole Fraction
- 2) How the natural rubber can be processed from latex?
- 3) Calculate molality of solution containing 4.9 gm of H_2SO_4 in 1.5 kg water.
(At. Wt.: H= 1, S = 32, O=16)

Q.5 A) Solve any two.

08

- 1) Explain refining of crude oil by fractional distillation.
- 2) Define Alloy. Explain any three purposes of making alloys, Give example of each.
- 3) Compare composition, properties and applications of steel.

B) Solve the following.

06

- 1) Define conducting polymers. Write its applications.
- 2) Calculate number average molecular weight of a polymer having following composition.
5 molecules of molecular weight each 50000 g/mole
15 molecules of molecular weight each 10000 g/mole
20 molecules of molecular weight each 15000 g/mole
10 molecules of molecular weight each 25000 g/mole

OR**Solve the following.**

- 1) Draw block diagram of instrumentation of GLC and write its uses.
- 2) Degree of polymerization of polystyrene is 5000. Calculate molecular weight of polystyrene. (Structure of styrene $\text{C}_6\text{H}_5\text{-CH=CH}_2$)

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II

Day & Date: Wednesday, 18-12-2019

Max. Marks: 70

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) To get accurate results in Bomb calorimeter experiment which of the following correction is suggested?

a) Heating correction	b) Alkaline correction
c) Cooling correction	d) None of these
- 2) Following is not the example of primary fuel _____.

a) Wood	b) Coal
c) Petrol	d) Natural gas
- 3) Ebonite is _____.

a) Polyethylene	b) Highly vulcanized rubber
c) Natural rubber	d) Synthetic rubber
- 4) Which of the following polymer contains nitrogen?

a) Nylon	b) Teflon
c) PVC	d) Terylene
- 5) In TGA curves horizontal portions represents that the compound is thermally _____.

a) Stable	b) Unstable
c) Both a & b	d) None of these
- 6) Hard water is unfit for use in boilers for steam raising because _____.

a) Causes wastage of fuel	b) Water undergoes decomposition
c) Forms scales inside the boiler	d) Both a & c
- 7) Hard water may be softened by passing it through _____.

a) Sodium silicate	b) Limestone
c) Ion exchange resins	d) Calcium silicate
- 8) Commonly used disinfectant is _____.

a) Chlorine	b) Bleaching powder
c) Lime	d) Both a & b
- 9) Animal and vegetable oils are _____.

a) Contains fatty acids	b) High viscosity
c) Good in oiliness	d) All of these

- 10) When graphite is dispersed in oil, it is called as _____.
a) Grease
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d) Oil dag
- 11) Metals at the top of electromotive series are _____.
a) Least active
b) More active
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d) None of these
- 12) Corrosion is an example of _____.
a) Oxidation - reduction process
b) Electro dialysis process
c) Hydrolysis
d) Reverse osmosis
- 13) Wrought iron is _____.
a) Ductile
b) Weldable
c) Malleable
d) All are correct
- 14) An alloy having high electrical resistance and can be used in heating appliances is _____.
a) Durallumin
b) Nichrome
c) Stainless steel
d) Brass

Seat No.	
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Set **S**

**F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING CHEMISTRY –I & ENGINEERING CHEMISTRY-II**

Day & Date: Wednesday, 18-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Attempt all questions.
2) Draw neat diagram wherever necessary.
3) Figures to right indicate full marks.

Section – I

Q.2 A) Solve any two. 08

- Describe Boundary (thin film) lubrication.
- Write traditional and greener pathway of synthesis of indigo dye.
- A sample of water on analysis was found to contain following impurities in ppm.

Impurities	Amount (ppm)	Mole. Wt
CaSO ₄	35	136
Ca (HCO ₃) ₂	46	162
MgCl ₂	54	95
CaCl ₂	42	111

Calculate temporary, permanent and total hardness of water sample.

B) Solve any two. 06

- Write any six principles of green chemistry.
- Describe estimation of hardness of water by EDTA method.
- Explain any three factors influencing corrosion of metal.

Q.3 A) Solve any two. 08

- Define corrosion. Explain wet corrosion with O₂ absorption mechanism.
- Explain disinfection of water with chemical reactions.
- Write a note on liquid lubricants.

B) Solve the following. 06

- Describe sacrificial anode method for protection of metal from corrosion.
- In an acid value determination experiment 13.5 gm of oil sample require 7.6 ml of N/10 KOH solution for neutralization to phenolphthalein end point. Calculate the acid value of oil sample. (Mole. Wt of KOH = 56)

Section – II

Q.4 A) Solve any two. 08

- Distinguish between thermosoftening and thermosetting plastics.
- Describe construction and working of Boy's calorimeter.
- Calculate gross and net calorific value of coal having the following composition in percentage, C = 82, H = 5.5, S = 3.5, N = 2.1, O = 3, Ash = 3.2
(Latent Heat of steam = 587 Kcal/kg)

B) Solve any two.

06

- 1) Define:
 - i) Calorific value
 - ii) Molality
 - iii) Mole Fraction
- 2) How the natural rubber can be processed from latex?
- 3) Calculate molality of solution containing 4.9 gm of H_2SO_4 in 1.5 kg water.
(At. Wt.: H= 1, S = 32, O=16)

Q.5 A) Solve any two.

08

- 1) Explain refining of crude oil by fractional distillation.
- 2) Define Alloy. Explain any three purposes of making alloys, Give example of each.
- 3) Compare composition, properties and applications of steel.

B) Solve the following.

06

- 1) Define conducting polymers. Write its applications.
- 2) Calculate number average molecular weight of a polymer having following composition.
5 molecules of molecular weight each 50000 g/mole
15 molecules of molecular weight each 10000 g/mole
20 molecules of molecular weight each 15000 g/mole
10 molecules of molecular weight each 25000 g/mole

OR**Solve the following.**

- 1) Draw block diagram of instrumentation of GLC and write its uses.
- 2) Degree of polymerization of polystyrene is 5000. Calculate molecular weight of polystyrene. (Structure of styrene $\text{C}_6\text{H}_5\text{-CH=CH}_2$)

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The order and the degree of the differential equation $x + \frac{dy}{dx} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ is _____.
a) 1, 2
b) 1, 1
c) 2, 2
d) 1, 3
- 2) The orthogonal trajectories of family of straight lines, $y = mx$, where 'm' is a parameter are _____.
a) $y^2 = ax$
b) $x^2 = by$
c) $x^2 + y^2 = a^2$
d) None of these
- 3) A particle moves along the curve $x = e^{-t}$, $y = 2 \cos 3t$, $z = 2 \sin 3t$ where t is the time. The magnitude of velocity vector at $t = 0$ is _____.
a) 37
b) 6
c) 7
d) $\sqrt{37}$
- 4) Which of the following is a vector?
a) Divergence of a vector
b) Curl of a vector
c) Gradient of a scalar
d) Both b and c
- 5) A vector field \bar{F} is said to be solenoidal if _____.
a) $\text{curl}\bar{F} = 0$
b) $\text{div}\bar{F} = 0$
c) $\text{grad}F = 0$
d) None of these
- 6) The p -series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is divergent if _____.
a) $p \leq 1$
b) $p = 0$
c) $p > 1$
d) $p = 2$
- 7) $\sum_{n=0}^{\infty} \frac{1}{n!} =$ _____.
a) 0
b) ∞
c) 1
d) e

- 8) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}} = \underline{\hspace{2cm}}$.
- a) $\sqrt{2\pi}$ b) $\sqrt{\frac{\pi}{2}}$
- c) $\sqrt{\pi}$ d) $\sqrt{2\pi}$
- 9) The curve $xy = c$ is symmetric _____.
- a) About both axes b) About x – axis
- c) About y – axis d) In opposite quadrants
- 10) Value of integral $\int_0^\infty e^{-x^4} dx$ is _____.
- a) $\frac{1}{2} \sqrt{\frac{1}{3}}$ b) $\sqrt{\frac{5}{4}}$
- c) $\frac{1}{4} \sqrt{\frac{1}{3}}$ d) $\frac{1}{3} \sqrt{\frac{1}{4}}$
- 11) Value of integral $\int_0^1 \int_0^{1-x} dx dy$ _____.
- a) $\frac{1}{3}$ b) $\frac{1-x}{2}$
- c) $\frac{1}{2}$ d) $\frac{(1-x)^2}{2}$
- 12) If the density ρ (rho) at a point of a uniform circular lamina varies as the square of its distance from fixed point on the circumference of circle then ρ is _____.
- a) $x^2 + y^2$ b) Kxy
- c) $K(x^2 + y^2)$ d) xy
- 13) Polar form of integral $\int_0^a \int_y^a dx dy = \underline{\hspace{2cm}}$.
- a) $\int_0^{\frac{\pi}{4}} \int_0^{a \cos \theta} r dr d\theta$ b) $\int_0^{\pi/2} \int_0^{a \sec \theta} r dr d\theta$
- c) $\int_0^{\pi/4} \int_0^{a \sec \theta} r dr d\theta$ d) $\int_0^{\pi/2} \int_0^{a \cos \theta} r dr d\theta$
- 14) Length of curve $2y = x^2$ from $x = 0$ to $x = 1$ is _____.
- a) $\sqrt{2} + \log \sqrt{2}$ b) $\sqrt{2} + \frac{1}{2} \log \sqrt{2}$
- c) $\frac{1}{\sqrt{2}} + \frac{1}{2} \log(1 + \sqrt{2})$ d) $2 + \log 2$

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

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

Section – I

Q.2 Attempt any three of the following. 09

- Solve $(2x - 2y + 5) \frac{dy}{dx} = x - y + 3$
- Find the orthogonal trajectories of the family of cardiodes $r = a(1 + \cos \theta)$.
- Find the tangential and normal components of acceleration of particle moving on the curve. $x = t^3 + 1, y = t^2, z = t$ at $t = 1$.
- Prove that $\nabla \cdot \left(r \nabla \frac{1}{r^3} \right) = \frac{3}{r^4}$
- Test the convergence of $\sum \left(1 + \frac{1}{n} \right)^{n^2}$

Q.3 Attempt any three of the following. 09

- Solve $\frac{dy}{dx} = x^3 y^3 - xy$.
- Test the convergence of $\frac{1.2}{3.4.5} + \frac{2.3}{4.5.6} + \frac{3.4}{5.6.7} + \dots$
- Solve $(\sec x \tan x \tan y - e^x) dx + \sec x \sec^2 y dy = 0$
- Prove that $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational.
- Solve $(1 + y^2) dx = (e^{\tan^{-1} y} - x) dy$.

Q.4 Attempt any two of the following 10

- A constant e.m.f. E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. The current i at any time t is given by $L \frac{di}{dt} + Ri = E$. If the initial current is zero, show that the current builds upto half its theoretical maximum value in $\frac{L}{R} \log 2$ seconds.
- Find the directional derivative of $\phi = x^2 y + y^2 z + z^2 x$ at $(2, 2, 2)$ in the direction of the normal to the surface $4x^2 y + 2z^2 = 2$ at the point $(2, -1, 3)$
- Examine for absolute and conditional convergence of $\sum \frac{(-1)^n}{\log n}$

Section – II

Q.5 Attempt any three from the following 09

- Evaluate $\int_0^{\infty} x^2 e^{-h^2 x^2} dx$
- Show that $\int_0^{\infty} \frac{\tan^{-1} ax}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a)$
- Trace the curve $r = a \cos 3\theta$ with full justification.

- d) Change the order of integration and evaluate $\int_0^a \int_y^{\sqrt{ay}} \frac{x}{x^2 + y^2} dx dy$
- e) Change to polar co-ordinate system and evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dy dx$

Q.6 Attempt any three from the following**09**

- a) Prove that $\int_0^\pi x \sin^5 x \cos^4 x dx = \frac{8\pi}{315}$
- b) Evaluate $\int \int (x^2 + y^2)x dx dy$ over region bounded by $x = 0, y = 0, y = x$ and $x = 1$.
- c) Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 y z dz dy dx$
- d) Find length of loop of the curve $9y^2 = x(3 - x)^2$
- e) Trace the curve $y^2 = (x - a)(x - b)(x - c)$ where $a < b < c$ with full justification.

Q.7 Attempt any two from the following**10**

- a) Prove the Duplication formula. $2^{2m-1} \sqrt{m} \sqrt{m + \frac{1}{2}} = \sqrt{\pi} \sqrt{2m}$
- b) Trace the curve $x = a(t - \sin t)$ $y = a(1 + \cos t)$ with full justification, also find its length measured from cusp to cusp.
- c) Find the mass of lamina bounded by curves $ay^2 = x^3$ and $by = x$, if density at a point varies as,
 i) Cube of distance of the point from x – axis.
 ii) The square of the distance of the point from x – axis.

Seat
No.**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}} = \underline{\hspace{2cm}}$.

a) $\sqrt{2\pi}$

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

c) $\sqrt{\pi}$

d) $\sqrt{2\pi}$

2) The curve $xy = c$ is symmetric _____.

a) About both axes

b) About x – axis

c) About y – axis

d) In opposite quadrants

3) Value of integral $\int_0^{\infty} e^{-x^4} dx$ is _____.

a) $\frac{1}{2} \sqrt{\frac{1}{3}}$

b) $\sqrt{\frac{5}{4}}$

c) $\frac{1}{4} \sqrt{\frac{1}{3}}$

d) $\frac{1}{3} \sqrt{\frac{1}{4}}$

4) Value of integral $\int_0^1 \int_0^{1-x} dx dy$ _____.

a) $\frac{1}{3}$

b) $\frac{1-x}{2}$

c) $\frac{1}{2}$

d) $\frac{(1-x)^2}{2}$

5) If the density ρ (rho) at a point of a uniform circular lamina varies as the square of its distance from fixed point on the circumference of circle then ρ is _____.

a) $x^2 + y^2$

b) Kxy

c) $K(x^2 + y^2)$

d) xy

6) Polar form of integral $\int_0^a \int_y^a dx dy = \underline{\hspace{2cm}}$.

a) $\int_0^{\frac{\pi}{4}} \int_0^{a \sec \theta} r dr d\theta$

b) $\int_0^{\frac{\pi}{2}} \int_0^{a \sec \theta} r dr d\theta$

c) $\int_0^{\frac{\pi}{4}} \int_0^{a \sec \theta} r dr d\theta$

d) $\int_0^{\frac{\pi}{2}} \int_0^{a \cos \theta} r dr d\theta$

- 7) Length of curve $2y = x^2$ from $x = 0$ to $x = 1$ is _____.
- a) $\sqrt{2} + \log\sqrt{2}$ b) $\sqrt{2} + \frac{1}{2}\log\sqrt{2}$
 c) $\frac{1}{\sqrt{2}} + \frac{1}{2}\log(1 + \sqrt{2})$ d) $2 + \log 2$
- 8) The order and the degree of the differential equation $x + \frac{dy}{dx} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ is _____.
- a) 1, 2 b) 1, 1
 c) 2, 2 d) 1, 3
- 9) The orthogonal trajectories of family of straight lines, $y = mx$, where 'm' is a parameter are _____.
- a) $y^2 = ax$ b) $x^2 = by$
 c) $x^2 + y^2 = a^2$ d) None of these
- 10) A particle moves along the curve $x = e^{-t}$, $y = 2 \cos 3t$, $z = 2 \sin 3t$ where t is the time. The magnitude of velocity vector at $t = 0$ is _____.
- a) 37 b) 6
 c) 7 d) $\sqrt{37}$
- 11) Which of the following is a vector?
- a) Divergence of a vector b) Curl of a vector
 c) Gradient of a scalar d) Both b and c
- 12) A vector field \bar{F} is said to be solenoidal if _____.
- a) $\text{curl}\bar{F} = 0$ b) $\text{div}\bar{F} = 0$
 c) $\text{grad}F = 0$ d) None of these
- 13) The p -series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is divergent if _____.
- a) $p \leq 1$ b) $p = 0$
 c) $p > 1$ d) $p = 2$
- 14) $\sum_{n=0}^{\infty} \frac{1}{n!} =$ _____.
- a) 0 b) ∞
 c) 1 d) E

Seat
No.

**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

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

Section – I

Q.2 Attempt any three of the following. **09**

- Solve $(2x - 2y + 5) \frac{dy}{dx} = x - y + 3$
- Find the orthogonal trajectories of the family of cardiodes $r = a(1 + \cos \theta)$.
- Find the tangential and normal components of acceleration of particle moving on the curve. $x = t^3 + 1, y = t^2, z = t$ at $t = 1$.
- Prove that $\nabla \cdot \left(r \nabla \frac{1}{r^3} \right) = \frac{3}{r^4}$
- Test the convergence of $\sum \left(1 + \frac{1}{n} \right)^{n^2}$

Q.3 Attempt any three of the following. **09**

- Solve $\frac{dy}{dx} = x^3 y^3 - xy$.
- Test the convergence of $\frac{1.2}{3.4.5} + \frac{2.3}{4.5.6} + \frac{3.4}{5.6.7} + \dots$
- Solve $(\sec x \tan x \tan y - e^x) dx + \sec x \sec^2 y dy = 0$
- Prove that $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational.
- Solve $(1 + y^2) dx = (e^{\tan^{-1} y} - x) dy$.

Q.4 Attempt any two of the following **10**

- A constant e.m.f. E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. The current i at any time t is given by $L \frac{di}{dt} + Ri = E$. If the initial current is zero, show that the current builds upto half its theoretical maximum value in $\frac{L}{R} \log 2$ seconds.
- Find the directional derivative of $\phi = x^2 y + y^2 z + z^2 x$ at $(2, 2, 2)$ in the direction of the normal to the surface $4x^2 y + 2z^2 = 2$ at the point $(2, -1, 3)$
- Examine for absolute and conditional convergence of $\sum \frac{(-1)^n}{\log n}$

Section – II

Q.5 Attempt any three from the following **09**

- Evaluate $\int_0^{\infty} x^2 e^{-h^2 x^2} dx$
- Show that $\int_0^{\infty} \frac{\tan^{-1} ax}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a)$
- Trace the curve $r = a \cos 3\theta$ with full justification.

- d) Change the order of integration and evaluate $\int_0^a \int_y^{\sqrt{ay}} \frac{x}{x^2 + y^2} dx dy$
- e) Change to polar co-ordinate system and evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dy dx$

Q.6 Attempt any three from the following**09**

- a) Prove that $\int_0^{\pi} x \sin^5 x \cos^4 x dx = \frac{8\pi}{315}$
- b) Evaluate $\int \int (x^2 + y^2)x dx dy$ over region bounded by $x = 0, y = 0, y = x$ and $x = 1$.
- c) Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 y z dz dy dx$
- d) Find length of loop of the curve $9y^2 = x(3 - x)^2$
- e) Trace the curve $y^2 = (x - a)(x - b)(x - c)$ where $a < b < c$ with full justification.

Q.7 Attempt any two from the following**10**

- a) Prove the Duplication formula. $2^{2m-1} \sqrt{m} \sqrt{m + \frac{1}{2}} = \sqrt{\pi} \sqrt{2m}$
- b) Trace the curve $x = a(t - \sin t)$ $y = a(1 + \cos t)$ with full justification, also find its length measured from cusp to cusp.
- c) Find the mass of lamina bounded by curves $ay^2 = x^3$ and $by = x$, if density at a point varies as,
 i) Cube of distance of the point from x – axis.
 ii) The square of the distance of the point from x – axis.

Seat No.	
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F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - II

Day & Date: Friday, 22-11-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
 2) Figures to the right indicate full marks.
 3) Use of non-programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Value of integral $\int_0^1 \int_0^{1-x} dx dy$ _____.
- | | |
|------------------|------------------------|
| a) $\frac{1}{3}$ | b) $\frac{1-x}{2}$ |
| c) $\frac{1}{2}$ | d) $\frac{(1-x)^2}{2}$ |
- 2) If the density ρ (rho) at a point of a uniform circular lamina varies as the square of its distance from fixed point on the circumference of circle then ρ is _____.
- | | |
|-------------------|----------|
| a) $x^2 + y^2$ | b) Kxy |
| c) $K(x^2 + y^2)$ | d) xy |
- 3) Polar form of integral $\int_0^a \int_y^a dx dy =$ _____.
- | | |
|---|---|
| a) $\int_0^{\frac{\pi}{4}} \int_0^{a \sec \theta} r dr d\theta$ | b) $\int_0^{\pi/2} \int_0^{a \sec \theta} r dr d\theta$ |
| c) $\int_0^{\pi/4} \int_0^{a \sec \theta} r dr d\theta$ | d) $\int_0^{\pi/2} \int_0^{a \cos \theta} r dr d\theta$ |
- 4) Length of curve $2y = x^2$ from $x = 0$ to $x = 1$ is _____.
- | | |
|--|---|
| a) $\sqrt{2} + \log \sqrt{2}$ | b) $\sqrt{2} + \frac{1}{2} \log \sqrt{2}$ |
| c) $\frac{1}{\sqrt{2}} + \frac{1}{2} \log(1 + \sqrt{2})$ | d) $2 + \log 2$ |
- 5) The order and the degree of the differential equation $x + \frac{dy}{dx} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ is _____.
- | | |
|---------|---------|
| a) 1, 2 | b) 1, 1 |
| c) 2, 2 | d) 1, 3 |
- 6) The orthogonal trajectories of family of straight lines, $y = mx$, where 'm' is a parameter are _____.
- | | |
|----------------------|------------------|
| a) $y^2 = ax$ | b) $x^2 = by$ |
| c) $x^2 + y^2 = a^2$ | d) None of these |

- 7) A particle moves along the curve $x = e^{-t}, y = 2 \cos 3t, z = 2 \sin 3t$ where t is the time. The magnitude of velocity vector at $t = 0$ is _____.
- a) 37 b) 6
 c) 7 d) $\sqrt{37}$
- 8) Which of the following is a vector?
- a) Divergence of a vector b) Curl of a vector
 c) Gradient of a scalar d) Both b and c
- 9) A vector field \bar{F} is said to be solenoidal if _____.
- a) $curl\bar{F} = 0$ b) $div\bar{F} = 0$
 c) $gradF = 0$ d) None of these
- 10) The p -series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is divergent if _____.
- a) $p \leq 1$ b) $p = 0$
 c) $p > 1$ d) $p = 2$
- 11) $\sum_{n=0}^{\infty} \frac{1}{n!} =$ _____.
- a) 0 b) ∞
 c) 1 d) e
- 12) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}} =$ _____.
- a) $\sqrt{2\pi}$ b) $\sqrt{\frac{\pi}{2}}$
 c) $\sqrt{\pi}$ d) $\sqrt{2\pi}$
- 13) The curve $xy = c$ is symmetric _____.
- a) About both axes b) About x – axis
 c) About y – axis d) In opposite quadrants
- 14) Value of integral $\int_0^{\infty} e^{-x^4} dx$ is _____.
- a) $\frac{1}{2} \sqrt{\frac{1}{3}}$ b) $\sqrt{\frac{5}{4}}$
 c) $\frac{1}{4} \sqrt{\frac{1}{3}}$ d) $\frac{1}{3} \sqrt{\frac{1}{4}}$

Seat No.	
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F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - II

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

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

Section – I

Q.2 Attempt any three of the following. **09**

- a) Solve $(2x - 2y + 5) \frac{dy}{dx} = x - y + 3$
- b) Find the orthogonal trajectories of the family of cardiodes $r = a(1 + \cos \theta)$.
- c) Find the tangential and normal components of acceleration of particle moving on the curve. $x = t^3 + 1, y = t^2, z = t$ at $t = 1$.
- d) Prove that $\nabla \cdot \left(r \nabla \frac{1}{r^3} \right) = \frac{3}{r^4}$
- e) Test the convergence of $\sum \left(1 + \frac{1}{n} \right)^{n^2}$

Q.3 Attempt any three of the following. **09**

- a) Solve $\frac{dy}{dx} = x^3 y^3 - xy$.
- b) Test the convergence of $\frac{1.2}{3.4.5} + \frac{2.3}{4.5.6} + \frac{3.4}{5.6.7} + \dots$
- c) Solve $(\sec x \tan x \tan y - e^x) dx + \sec x \sec^2 y dy = 0$
- d) Prove that $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational.
- e) Solve $(1 + y^2) dx = (e^{\tan^{-1} y} - x) dy$.

Q.4 Attempt any two of the following **10**

- a) A constant e.m.f. E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. The current i at any time t is given by $L \frac{di}{dt} + Ri = E$. If the initial current is zero, show that the current builds upto half its theoretical maximum value in $\frac{L}{R} \log 2$ seconds.
- b) Find the directional derivative of $\phi = x^2 y + y^2 z + z^2 x$ at $(2, 2, 2)$ in the direction of the normal to the surface $4x^2 y + 2z^2 = 2$ at the point $(2, -1, 3)$
- c) Examine for absolute and conditional convergence of $\sum \frac{(-1)^n}{\log n}$

Section – II

Q.5 Attempt any three from the following **09**

- a) Evaluate $\int_0^{\infty} x^2 e^{-h^2 x^2} dx$
- b) Show that $\int_0^{\infty} \frac{\tan^{-1} ax}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a)$
- c) Trace the curve $r = a \cos 3\theta$ with full justification.

- d) Change the order of integration and evaluate $\int_0^a \int_y^{\sqrt{ay}} \frac{x}{x^2 + y^2} dx dy$
- e) Change to polar co-ordinate system and evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dy dx$

Q.6 Attempt any three from the following**09**

- a) Prove that $\int_0^{\pi} x \sin^5 x \cos^4 x dx = \frac{8\pi}{315}$
- b) Evaluate $\int \int (x^2 + y^2)x dx dy$ over region bounded by $x = 0, y = 0, y = x$ and $x = 1$.
- c) Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 yz dz dy dx$
- d) Find length of loop of the curve $9y^2 = x(3 - x)^2$
- e) Trace the curve $y^2 = (x - a)(x - b)(x - c)$ where $a < b < c$ with full justification.

Q.7 Attempt any two from the following**10**

- a) Prove the Duplication formula. $2^{2m-1} \sqrt{m} \sqrt{m + \frac{1}{2}} = \sqrt{\pi} \sqrt{2m}$
- b) Trace the curve $x = a(t - \sin t)$ $y = a(1 + \cos t)$ with full justification, also find its length measured from cusp to cusp.
- c) Find the mass of lamina bounded by curves $ay^2 = x^3$ and $by = x$, if density at a point varies as,
 i) Cube of distance of the point from x – axis.
 ii) The square of the distance of the point from x – axis.

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The p -series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is divergent if _____.
 - a) $p \leq 1$
 - b) $p = 0$
 - c) $p > 1$
 - d) $p = 2$
- 2) $\sum_{n=0}^{\infty} \frac{1}{n!} =$ _____.
 - a) 0
 - b) ∞
 - c) 1
 - d) e
- 3) $\sqrt{\frac{1}{4}} \sqrt{\frac{3}{4}} =$ _____.
 - a) $\sqrt{2\pi}$
 - b) $\sqrt{\frac{\pi}{2}}$
 - c) $\sqrt{\pi}$
 - d) $\sqrt{2\pi}$
- 4) The curve $xy = c$ is symmetric _____.
 - a) About both axes
 - b) About x – axis
 - c) About y – axis
 - d) In opposite quadrants
- 5) Value of integral $\int_0^{\infty} e^{-x^4} dx$ is _____.
 - a) $\frac{1}{2} \sqrt{\frac{1}{3}}$
 - b) $\sqrt{\frac{5}{4}}$
 - c) $\frac{1}{4} \sqrt{\frac{1}{3}}$
 - d) $\frac{1}{3} \sqrt{\frac{1}{4}}$
- 6) Value of integral $\int_0^1 \int_0^{1-x} dx dy$ _____.
 - a) $\frac{1}{3}$
 - b) $\frac{1-x}{2}$
 - c) $\frac{1}{2}$
 - d) $\frac{(1-x)^2}{2}$

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

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

Section – I

Q.2 Attempt any three of the following. 09

- Solve $(2x - 2y + 5) \frac{dy}{dx} = x - y + 3$
- Find the orthogonal trajectories of the family of cardiodes $r = a(1 + \cos \theta)$.
- Find the tangential and normal components of acceleration of particle moving on the curve. $x = t^3 + 1, y = t^2, z = t$ at $t = 1$.
- Prove that $\nabla \cdot \left(r \nabla \frac{1}{r^3} \right) = \frac{3}{r^4}$
- Test the convergence of $\sum \left(1 + \frac{1}{n} \right)^{n^2}$

Q.3 Attempt any three of the following. 09

- Solve $\frac{dy}{dx} = x^3 y^3 - xy$.
- Test the convergence of $\frac{1.2}{3.4.5} + \frac{2.3}{4.5.6} + \frac{3.4}{5.6.7} + \dots$
- Solve $(\sec x \tan x \tan y - e^x) dx + \sec x \sec^2 y dy = 0$
- Prove that $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational.
- Solve $(1 + y^2) dx = (e^{\tan^{-1} y} - x) dy$.

Q.4 Attempt any two of the following 10

- A constant e.m.f. E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. The current i at any time t is given by $L \frac{di}{dt} + Ri = E$. If the initial current is zero, show that the current builds upto half its theoretical maximum value in $\frac{L}{R} \log 2$ seconds.
- Find the directional derivative of $\phi = x^2 y + y^2 z + z^2 x$ at $(2,2,2)$ in the direction of the normal to the surface $4x^2 y + 2z^2 = 2$ at the point $(2,-1,3)$
- Examine for absolute and conditional convergence of $\sum \frac{(-1)^n}{\log n}$

Section – II

Q.5 Attempt any three from the following 09

- Evaluate $\int_0^{\infty} x^2 e^{-h^2 x^2} dx$
- Show that $\int_0^{\infty} \frac{\tan^{-1} ax}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a)$
- Trace the curve $r = a \cos 3\theta$ with full justification.

- d) Change the order of integration and evaluate $\int_0^a \int_y^{\sqrt{ay}} \frac{x}{x^2 + y^2} dx dy$
- e) Change to polar co-ordinate system and evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dy dx$

Q.6 Attempt any three from the following**09**

- a) Prove that $\int_0^{\pi} x \sin^5 x \cos^4 x dx = \frac{8\pi}{315}$
- b) Evaluate $\int \int (x^2 + y^2)x dx dy$ over region bounded by $x = 0, y = 0, y = x$ and $x = 1$.
- c) Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 yz dz dy dx$
- d) Find length of loop of the curve $9y^2 = x(3 - x)^2$
- e) Trace the curve $y^2 = (x - a)(x - b)(x - c)$ where $a < b < c$ with full justification.

Q.7 Attempt any two from the following**10**

- a) Prove the Duplication formula. $2^{2m-1} \sqrt{m} \sqrt{m + \frac{1}{2}} = \sqrt{\pi} \sqrt{2m}$
- b) Trace the curve $x = a(t - \sin t)$ $y = a(1 + \cos t)$ with full justification, also find its length measured from cusp to cusp.
- c) Find the mass of lamina bounded by curves $ay^2 = x^3$ and $by = x$, if density at a point varies as,
 i) Cube of distance of the point from x – axis.
 ii) The square of the distance of the point from x – axis.

Seat No.	
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Set **P**

F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
 Time: 10.00 AM To 01.00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
 2) Use of non-programmable scientific calculator is allowed.
 3) Figures to right indicate full marks.
 4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) Following is not a branch of civil engineering _____.
 a) automobile engineering b) soil mechanics
 c) environmental engineering d) hydraulic engineering
- 2) Hydrographic surveys deal with the mapping of _____.
 a) Heavenly bodies b) Hills
 c) Large water bodies d) Canal system
- 3) Which of the following reference direction is used in a geodetic survey?
 a) True meridian b) Magnetic meridian
 c) Arbitrary meridian d) Any of the these
- 4) Fly leveling is adopted for the purpose of _____.
 a) Establishing new bench Marks
 b) For checking accuracy of work
 c) For fixing alignment of road, canal
 d) All the above
- 5) A length of link of a metric chain is _____.
 a) 10 cm b) 20 cm
 c) 30 cm d) 100 cm
- 6) No reservoir is formed in following type of Dam _____.
 a) Storage dam b) Diversion dam
 c) Both a and b d) None of the above
- 7) The portion of a road surface, which is used by vehicular traffic, is known as _____.
 a) carriage-way b) Shoulder
 c) express way d) all of the above
- 8) The lowest part of a structure which transmits the load to the soil is known as _____.
 a) Super – structure b) Plinth
 c) Foundation d) Parapet
- 9) When two or more footings are connected by a beam, it is called _____.
 a) beam footing b) combined footing
 c) strap footing d) mat footing

- 10) One of the following does not affect FAR _____.
a) Type of construction b) Locality of density
c) Parking facilities d) Colour of building
- 11) Privacy is of utmost importance in case of _____.
a) Bedroom b) W/c
c) Bathroom d) All of above
- 12) A good building stone should have _____.
a) Strength b) hardness and toughness
c) resistance to fire d) all of the above
- 13) Initial setting time for cement should not be less than _____.
a) 30 min b) 120 min
c) 180 min d) 360 min
- 14) Electromagnetic energy moves with velocity of _____.
a) Light b) Sound
c) Magnet d) Electricity

Seat No.	
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**F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable scientific calculator is allowed.
4) Assume suitable data if necessary and state it clearly.

Section – I

Q.2 Attempt any four of the following. **12**

- Explain with examples knowledge of civil engineering is applicable to other branches of engineering.
- Explain the role of civil engineering various construction activities.
- With neat sketch explain reciprocal ranging.
- What is mean by local attraction? How to detect it.
- What are the temporary adjustment of dumpy level explain with neat sketches.
- With neat sketch explain different storage zones of reservoir.
- Give the detailed classification of road as per IRC.

Q.3 Attempt any two of the following. **16**

- The length of survey line was measured with a 20 m chain and was found to be 1200m. As a check the length was again measured 25 m chain and was found to be 1212 m. On comparing with test gauge it was found to be 1 decimeter too long. Find the actual length of the chain used.
- The observed whole circle bearings in a closed compass traverse ABCDA are given below.

Line	AB	BC	CD	DA
FB	46°10'	199°20'	169°30'	280°20'
BB	226°10'	298°40'	351°10'	99°20'

Calculate the inclined angle and apply correction for local attraction and find corrected fore and back bearings. Draw a neat sketch of the traverse. Calculations are must.

- The following reading were taken in running a line of levels from a BM of 100.00
BS: 1.290 (on BM), 3.115, 0.235, -1.125 (bottom of lintel)
FS: 0.025, 0.975, -1.095 (bottom of lintel), 3.565 (at B)
Work out staff readings and rule out a page in details

Section – II

Q.4 Attempt any four of the following. **12**

- Differentiate between load bearing and framed structure.
- Explain the requirements of earthquake resistant buildings with neat sketches.
- Enlist different principles of planning and explain any two with neat sketches.
- Enlist the ideal engineering properties and uses of plastic and aluminium.
- Differentiate between plain and Reinforced cement concrete.
- Write a short note on green building.

Q.5 Attempt any two of the following.

- a)** Explain with neat sketch different elements of framed structure. Also give the use of each element.
- b)** What are the different building bye laws? Explain any two with neat sketches.
- c)** Explain the working of remote sensing system and give the applications of GPS.

Seat No.	
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**F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Use of non-programmable scientific calculator is allowed.
3) Figures to right indicate full marks.
4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) The lowest part of a structure which transmits the load to the soil is known as _____.
a) Super - structure b) plinth
c) foundation d) parapet
- 2) When two or more footings are connected by a beam, it is called _____.
a) beam footing b) combined footing
c) strap footing d) mat footing
- 3) One of the following does not affect FAR _____.
a) Type of construction b) Locality of density
c) Parking facilities d) Colour of building
- 4) Privacy is of utmost importance in case of _____.
a) Bedroom b) W/c
c) Bathroom d) All of above
- 5) A good building stone should have _____.
a) strength b) hardness and toughness
c) resistance to fire d) all of the above
- 6) Initial setting time for cement should not be less than _____.
a) 30 min b) 120 min
c) 180 min d) 360 min
- 7) Electromagnetic energy moves with velocity of _____.
a) Light b) Sound
c) Magnet d) Electricity
- 8) Following is not a branch of civil engineering _____.
a) automobile engineering b) soil mechanics
c) environmental engineering d) hydraulic engineering
- 9) Hydrographic surveys deal with the mapping of _____.
a) Heavenly bodies b) Hills
c) Large water bodies d) Canal system
- 10) Which of the following reference direction is used in a geodetic survey?
a) True meridian b) Magnetic meridian
c) Arbitrary meridian d) Any of the these

- 11) Fly leveling is adopted for the purpose of _____.
- a) Establishing new bench Marks
 - b) For checking accuracy of work
 - c) For fixing alignment of road, canal
 - d) All the above
- 12) A length of link of a metric chain is _____.
- a) 10 cm
 - b) 20 cm
 - c) 30 cm
 - d) 100 cm
- 13) No reservoir is formed in following type of Dam _____.
- a) Storage dam
 - b) Diversion dam
 - c) Both a and b
 - d) None of the above
- 14) The portion of a road surface, which is used by vehicular traffic, is known as _____.
- a) carriage-way
 - b) shoulder
 - c) express way
 - d) all of the above

Seat No.	
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Set **Q**

F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable scientific calculator is allowed.
4) Assume suitable data if necessary and state it clearly.

Section – I

Q.2 Attempt any four of the following. **12**

- a) Explain with examples knowledge of civil engineering is applicable to other branches of engineering.
- b) Explain the role of civil engineering various construction activities.
- c) With neat sketch explain reciprocal ranging.
- d) What is mean by local attraction? How to detect it.
- e) What are the temporary adjustment of dumpy level explain with neat sketches.
- f) With neat sketch explain different storage zones of reservoir.
- g) Give the detailed classification of road as per IRC.

Q.3 Attempt any two of the following. **16**

- a) The length of survey line was measured with a 20 m chain and was found to be 1200m. As a check the length was again measured 25 m chain and was found to be 1212 m. On comparing with test gauge it was found to be 1 decimeter too long. Find the actual length of the chain used.
- b) The observed whole circle bearings in a closed compass traverse ABCDA are given below.

Line	AB	BC	CD	DA
FB	46°10'	199°20'	169°30'	280°20'
BB	226°10'	298°40'	351°10'	99°20'

Calculate the inclined angle and apply correction for local attraction and find corrected fore and back bearings. Draw a neat sketch of the traverse. Calculations are must.

- c) The following reading were taken in running a line of levels from a BM of 100.00
BS: 1.290 (on BM), 3.115, 0.235, -1.125 (bottom of lintel)
FS: 0.025, 0.975, -1.095 (bottom of lintel), 3.565 (at B)
Work out staff readings and rule out a page in details

Section – II

Q.4 Attempt any four of the following. **12**

- a) Differentiate between load bearing and framed structure.
- b) Explain the requirements of earthquake resistant buildings with neat sketches.
- c) Enlist different principles of planning and explain any two with neat sketches.
- d) Enlist the ideal engineering properties and uses of plastic and aluminium.
- e) Differentiate between plain and Reinforced cement concrete.
- f) Write a short note on green building.

Q.5 Attempt any two of the following.

- a)** Explain with neat sketch different elements of framed structure. Also give the use of each element.
- b)** What are the different building bye laws? Explain any two with neat sketches.
- c)** Explain the working of remote sensing system and give the applications of GPS.

Seat No.	
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**F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Use of non-programmable scientific calculator is allowed.
3) Figures to right indicate full marks.
4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) A length of link of a metric chain is _____.
a) 10 cm b) 20 cm
c) 30 cm d) 100 cm
- 2) No reservoir is formed in following type of Dam _____.
a) Storage dam b) Diversion dam
c) Both a and b d) None of the above
- 3) The portion of a road surface, which is used by vehicular traffic, is known as _____.
a) carriage-way b) Shoulder
c) express way d) all of the above
- 4) The lowest part of a structure which transmits the load to the soil is known as _____.
a) Super - structure b) Plinth
c) foundation d) Parapet
- 5) When two or more footings are connected by a beam, it is called _____.
a) beam footing b) combined footing
c) strap footing d) mat footing
- 6) One of the following does not affect FAR _____.
a) Type of construction b) Locality of density
c) Parking facilities d) Colour of building
- 7) Privacy is of utmost importance in case of _____.
a) Bedroom b) W/c
c) Bathroom d) All of above
- 8) A good building stone should have _____.
a) strength b) hardness and toughness
c) resistance to fire d) all of the above
- 9) Initial setting time for cement should not be less than _____.
a) 30 min b) 120 min
c) 180 min d) 360 min

- 10) Electromagnetic energy moves with velocity of _____.
a) Light b) Sound
c) Magnet d) Electricity

- 11) Following is not a branch of civil engineering _____.
a) automobile engineering b) soil mechanics
c) environmental engineering d) hydraulic engineering

- 12) Hydrographic surveys deal with the mapping of _____.
a) Heavenly bodies b) Hills
c) Large water bodies d) Canal system

- 13) Which of the following reference direction is used in a geodetic survey?
a) True meridian b) Magnetic meridian
c) Arbitrary meridian d) Any of the these

- 14) Fly leveling is adopted for the purpose of _____.
a) Establishing new bench Marks
b) For checking accuracy of work
c) For fixing alignment of road, canal
d) All the above

Seat No.	
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**F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable scientific calculator is allowed.
4) Assume suitable data if necessary and state it clearly.

Section – I

Q.2 Attempt any four of the following. **12**

- Explain with examples knowledge of civil engineering is applicable to other branches of engineering.
- Explain the role of civil engineering various construction activities.
- With neat sketch explain reciprocal ranging.
- What is mean by local attraction? How to detect it.
- What are the temporary adjustment of dumpy level explain with neat sketches.
- With neat sketch explain different storage zones of reservoir.
- Give the detailed classification of road as per IRC.

Q.3 Attempt any two of the following. **16**

- The length of survey line was measured with a 20 m chain and was found to be 1200m. As a check the length was again measured 25 m chain and was found to be 1212 m. On comparing with test gauge it was found to be 1 decimeter too long. Find the actual length of the chain used.
- The observed whole circle bearings in a closed compass traverse ABCDA are given below.

Line	AB	BC	CD	DA
FB	46°10'	199°20'	169°30'	280°20'
BB	226°10'	298°40'	351°10'	99°20'

Calculate the inclined angle and apply correction for local attraction and find corrected fore and back bearings. Draw a neat sketch of the traverse. Calculations are must.

- The following reading were taken in running a line of levels from a BM of 100.00
BS: 1.290 (on BM), 3.115, 0.235, -1.125 (bottom of lintel)
FS: 0.025, 0.975, -1.095 (bottom of lintel), 3.565 (at B)
Work out staff readings and rule out a page in details

Section – II

Q.4 Attempt any four of the following. **12**

- Differentiate between load bearing and framed structure.
- Explain the requirements of earthquake resistant buildings with neat sketches.
- Enlist different principles of planning and explain any two with neat sketches.
- Enlist the ideal engineering properties and uses of plastic and aluminium.
- Differentiate between plain and Reinforced cement concrete.
- Write a short note on green building.

Q.5 Attempt any two of the following.

- a)** Explain with neat sketch different elements of framed structure. Also give the use of each element.
- b)** What are the different building bye laws? Explain any two with neat sketches.
- c)** Explain the working of remote sensing system and give the applications of GPS.

Seat No.	
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F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Use of non-programmable scientific calculator is allowed.
3) Figures to right indicate full marks.
4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) One of the following does not affect FAR _____.

a) Type of construction	b) Locality of density
c) Parking facilities	d) Colour of building
- 2) Privacy is of utmost importance in case of _____.

a) Bedroom	b) W/c
c) Bathroom	d) All of above
- 3) A good building stone should have _____.

a) Strength	b) hardness and toughness
c) resistance to fire	d) all of the above
- 4) Initial setting time for cement should not be less than _____.

a) 30 min	b) 120 min
c) 180 min	d) 360 min
- 5) Electromagnetic energy moves with velocity of _____.

a) Light	b) Sound
c) Magnet	d) Electricity
- 6) Following is not a branch of civil engineering _____.

a) automobile engineering	b) soil mechanics
c) environmental engineering	d) hydraulic engineering
- 7) Hydrographic surveys deal with the mapping of _____.

a) Heavenly bodies	b) Hills
c) Large water bodies	d) Canal system
- 8) Which of the following reference direction is used in a geodetic survey?

a) True meridian	b) Magnetic meridian
c) Arbitrary meridian	d) Any of the these
- 9) Fly leveling is adopted for the purpose of _____.

a) Establishing new bench Marks	b) For checking accuracy of work
c) For fixing alignment of road, canal	d) All the above

- 10) A length of link of a metric chain is _____.
a) 10 cm b) 20 cm
c) 30 cm d) 100 cm
- 11) No reservoir is formed in following type of Dam _____.
a) Storage dam b) Diversion dam
c) Both a and b d) None of the above
- 12) The portion of a road surface, which is used by vehicular traffic, is known as _____.
a) carriage-way b) Shoulder
c) express way d) all of the above
- 13) The lowest part of a structure which transmits the load to the soil is known as _____.
a) Super - structure b) Plinth
c) foundation d) Parapet
- 14) When two or more footings are connected by a beam, it is called _____.
a) beam footing b) combined footing
c) strap footing d) mat footing

Seat No.	
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Set **S**

**F.E. (Part -II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10.00 AM To 01.00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable scientific calculator is allowed.
4) Assume suitable data if necessary and state it clearly.

Section – I

Q.2 Attempt any four of the following. **12**

- Explain with examples knowledge of civil engineering is applicable to other branches of engineering.
- Explain the role of civil engineering various construction activities.
- With neat sketch explain reciprocal ranging.
- What is mean by local attraction? How to detect it.
- What are the temporary adjustment of dumpy level explain with neat sketches.
- With neat sketch explain different storage zones of reservoir.
- Give the detailed classification of road as per IRC.

Q.3 Attempt any two of the following. **16**

- The length of survey line was measured with a 20 m chain and was found to be 1200m. As a check the length was again measured 25 m chain and was found to be 1212 m. On comparing with test gauge it was found to be 1 decimeter too long. Find the actual length of the chain used.
- The observed whole circle bearings in a closed compass traverse ABCDA are given below.

Line	AB	BC	CD	DA
FB	46°10'	199°20'	169°30'	280°20'
BB	226°10'	298°40'	351°10'	99°20'

Calculate the inclined angle and apply correction for local attraction and find corrected fore and back bearings. Draw a neat sketch of the traverse. Calculations are must.

- The following reading were taken in running a line of levels from a BM of 100.00
BS: 1.290 (on BM), 3.115, 0.235, -1.125 (bottom of lintel)
FS: 0.025, 0.975, -1.095 (bottom of lintel), 3.565 (at B)
Work out staff readings and rule out a page in details

Section – II

Q.4 Attempt any four of the following. **12**

- Differentiate between load bearing and framed structure.
- Explain the requirements of earthquake resistant buildings with neat sketches.
- Enlist different principles of planning and explain any two with neat sketches.
- Enlist the ideal engineering properties and uses of plastic and aluminium.
- Differentiate between plain and Reinforced cement concrete.
- Write a short note on green building.

Q.5 Attempt any two of the following.

- a)** Explain with neat sketch different elements of framed structure. Also give the use of each element.
- b)** What are the different building bye laws? Explain any two with neat sketches.
- c)** Explain the working of remote sensing system and give the applications of GPS.

Seat No.	
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Set	P
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F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 12:00 PM

Max. Marks: 35

Instructions: 1) MCQ should be solved in first 15 minutes.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 15 Minutes

Marks: 07

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 07

- 1) See back effect is observed in _____.
 - a) LVDT
 - b) Strain gauge
 - c) RTD
 - d) Thermocouple
- 2) The logic gate giving output high when both inputs are low is _____.
 - a) OR
 - b) NAND
 - c) AND
 - d) None of these
- 3) Rectifier efficiency of a full wave rectifier is _____.
 - a) 48.6%
 - b) 40.6%
 - c) 78%
 - d) 81.2%
- 4) $A+AB=$ _____.
 - a) A
 - b) AB
 - c) B
 - d) A+B
- 5) The average value of half wave rectifier is _____.
 - a) 0.159Vm
 - b) 0.318Vm
 - c) 0.63Vm
 - d) 0.707Vm
- 6) The relation between α and β is given by _____.
 - a) $\alpha = \beta / (1 - \beta)$
 - b) $\alpha = \beta / (1 + \beta)$
 - c) $\alpha = (1 + \beta) / \beta$
 - d) $\alpha = 1 / (1 + \beta)$
- 7) For CB configuration, current amplification factor is _____.
 - a) I_C/I_B
 - b) I_E/I_B
 - c) I_C/I_E
 - d) I_B/I_E

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 12:00 PM

Max. Marks: 28

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Section – I

- Q.2 Attempt any two of the following questions. 06**
- Explain P- type & N- type semiconductors.
 - Describe active, cut off and saturation regions of transistor.
 - Explain capacitor filter with suitable waveform & circuit diagram.
- Q.3 Attempt any two of the following questions. 08**
- Explain half wave rectifier with suitable diagram. Derive expression for efficiency.
 - Explain common emitter transistor configuration with I/P and O/P characteristics.
 - Explain 7 segment LED display with suitable circuit diagram.

Section – II

- Q.4 Attempt any two of the following questions. 06**
- Explain photo electric pickup.
 - Simplify following Boolean expressions.
 - $Y = \overline{(A + B + C)} \cdot (\overline{A} + B + C)$
 - $Y = \overline{(\overline{AB} + \overline{A} + AB)}$
 - Implement basic gates using NAND gates only.
- Q.5 Attempt any two of the following questions. 08**
- Discuss selection parameters of electrical transducer.
 - Perform binary subtraction using 2's complement method only
 - Subtract $(74)_8$ from $(143)_8$
 - Subtract $(4AC)_{16}$ from $(5FF)_{16}$
 - Explain LVDT with suitable diagrams.

Seat No.	
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F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 12:00 PM

Max. Marks: 35

- Instructions:** 1) MCQ should be solved in first 15 minutes.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 15 Minutes

Marks: 07

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 07

- 1) The average value of half wave rectifier is _____.
 a) 0.159Vm b) 0.318Vm
 c) 0.63Vm d) 0.707Vm
- 2) The relation between α and β is given by _____.
 a) $\alpha = \beta / (1 - \beta)$ b) $\alpha = \beta / (1 + \beta)$
 c) $\alpha = (1 + \beta) / \beta$ d) $\alpha = 1 / (1 + \beta)$
- 3) For CB configuration, current amplification factor is _____.
 a) I_C/I_B b) I_E/I_B
 c) I_C/I_E d) I_B/I_E
- 4) See back effect is observed in _____.
 a) LVDT b) Strain gauge
 c) RTD d) Thermocouple
- 5) The logic gate giving output high when both inputs are low is _____.
 a) OR b) NAND
 c) AND d) None of these
- 6) Rectifier efficiency of a full wave rectifier is _____.
 a) 48.6% b) 40.6%
 c) 78% d) 81.2%
- 7) $A+AB=$ _____.
 a) A b) AB
 c) B d) A+B

Seat No.	
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F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS

Day & Date: Monday, 25-11-2019
 Time: 10:00 AM To 12:00 PM

Max. Marks: 28

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

- Q.2 Attempt any two of the following questions. 06**
 a) Explain P- type & N- type semiconductors.
 b) Describe active, cut off and saturation regions of transistor.
 c) Explain capacitor filter with suitable waveform & circuit diagram.
- Q.3 Attempt any two of the following questions. 08**
 a) Explain half wave rectifier with suitable diagram. Derive expression for efficiency.
 b) Explain common emitter transistor configuration with I/P and O/P characteristics.
 c) Explain 7 segment LED display with suitable circuit diagram.

Section – II

- Q.4 Attempt any two of the following questions. 06**
 a) Explain photo electric pickup.
 b) Simplify following Boolean expressions.
 i) $Y = \overline{(A + B + C)} \cdot (\overline{A} + B + C)$
 ii) $Y = \overline{(\overline{AB} + \overline{A} + AB)}$
 c) Implement basic gates using NAND gates only.
- Q.5 Attempt any two of the following questions. 08**
 a) Discuss selection parameters of electrical transducer.
 b) Perform binary subtraction using 2's complement method only
 i) Subtract $(74)_8$ from $(143)_8$
 ii) Subtract $(4AC)_{16}$ from $(5FF)_{16}$
 c) Explain LVDT with suitable diagrams.

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 12:00 PM

Max. Marks: 35

Instructions: 1) MCQ should be solved in first 15 minutes.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 15 Minutes

Marks: 07

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 07

- 1) Rectifier efficiency of a full wave rectifier is _____.
a) 48.6% b) 40.6%
c) 78% d) 81.2%
- 2) $A+AB=$ _____.
a) A b) AB
c) B d) A+B
- 3) The average value of half wave rectifier is _____.
a) 0.159Vm b) 0.318Vm
c) 0.63Vm d) 0.707Vm
- 4) The relation between α and β is given by _____.
a) $\alpha = \beta / (1 - \beta)$ b) $\alpha = \beta / (1 + \beta)$
c) $\alpha = (1 + \beta) / \beta$ d) $\alpha = 1 / (1 + \beta)$
- 5) For CB configuration, current amplification factor is _____.
a) I_C/I_B b) I_E/I_B
c) I_C/I_E d) I_B/I_E
- 6) See back effect is observed in _____.
a) LVDT b) Strain gauge
c) RTD d) Thermocouple
- 7) The logic gate giving output high when both inputs are low is _____.
a) OR b) NAND
c) AND d) None of these

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 12:00 PM

Max. Marks: 28

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Section – I

- Q.2 Attempt any two of the following questions. 06**
- Explain P- type & N- type semiconductors.
 - Describe active, cut off and saturation regions of transistor.
 - Explain capacitor filter with suitable waveform & circuit diagram.
- Q.3 Attempt any two of the following questions. 08**
- Explain half wave rectifier with suitable diagram. Derive expression for efficiency.
 - Explain common emitter transistor configuration with I/P and O/P characteristics.
 - Explain 7 segment LED display with suitable circuit diagram.

Section – II

- Q.4 Attempt any two of the following questions. 06**
- Explain photo electric pickup.
 - Simplify following Boolean expressions.
 - $Y = \overline{(A + B + C)} \cdot (\overline{A} + B + C)$
 - $Y = \overline{(\overline{AB} + \overline{A} + AB)}$
 - Implement basic gates using NAND gates only.
- Q.5 Attempt any two of the following questions. 08**
- Discuss selection parameters of electrical transducer.
 - Perform binary subtraction using 2's complement method only
 - Subtract $(74)_8$ from $(143)_8$
 - Subtract $(4AC)_{16}$ from $(5FF)_{16}$
 - Explain LVDT with suitable diagrams.

Seat No.	
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**F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 12:00 PM

Max. Marks: 35

- Instructions:** 1) MCQ should be solved in first 15 minutes.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 15 Minutes

Marks: 07

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 07

- 1) The relation between α and β is given by _____.
 - a) $\alpha = \beta / (1 - \beta)$
 - b) $\alpha = \beta / (1 + \beta)$
 - c) $\alpha = (1 + \beta) / \beta$
 - d) $\alpha = 1 / (1 + \beta)$
- 2) For CB configuration, current amplification factor is _____.
 - a) I_C/I_B
 - b) I_E/I_B
 - c) I_C/I_E
 - d) I_B/I_E
- 3) See back effect is observed in _____.
 - a) LVDT
 - b) Strain gauge
 - c) RTD
 - d) Thermocouple
- 4) The logic gate giving output high when both inputs are low is _____.
 - a) OR
 - b) NAND
 - c) AND
 - d) None of these
- 5) Rectifier efficiency of a full wave rectifier is _____.
 - a) 48.6%
 - b) 40.6%
 - c) 78%
 - d) 81.2%
- 6) $A+AB=$ _____.
 - a) A
 - b) AB
 - c) B
 - d) A+B
- 7) The average value of half wave rectifier is _____.
 - a) 0.159Vm
 - b) 0.318Vm
 - c) 0.63Vm
 - d) 0.707Vm

Seat No.	
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F.E. (Part – II) (Old) (CBCS) Examination Nov/Dec-2019
BASIC ELECTRONICS

Day & Date: Monday, 25-11-2019
 Time: 10:00 AM To 12:00 PM

Max. Marks: 28

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

- Q.2 Attempt any two of the following questions. 06**
- Explain P- type & N- type semiconductors.
 - Describe active, cut off and saturation regions of transistor.
 - Explain capacitor filter with suitable waveform & circuit diagram.
- Q.3 Attempt any two of the following questions. 08**
- Explain half wave rectifier with suitable diagram. Derive expression for efficiency.
 - Explain common emitter transistor configuration with I/P and O/P characteristics.
 - Explain 7 segment LED display with suitable circuit diagram.

Section – II

- Q.4 Attempt any two of the following questions. 06**
- Explain photo electric pickup.
 - Simplify following Boolean expressions.
 - $Y = \overline{(A + B + C)} \cdot (\overline{A} + B + C)$
 - $Y = \overline{(\overline{AB} + \overline{A} + AB)}$
 - Implement basic gates using NAND gates only.
- Q.5 Attempt any two of the following questions. 08**
- Discuss selection parameters of electrical transducer.
 - Perform binary subtraction using 2's complement method only
 - Subtract $(74)_8$ from $(143)_8$
 - Subtract $(4AC)_{16}$ from $(5FF)_{16}$
 - Explain LVDT with suitable diagrams.

Seat
No.

**F.E. (Part - II) (Old) (CBCS) Examination Nov/Dec-2019
ENGINEERING GRAPHICS**

Day & Date: Tuesday, 26-11-2019
Time: 10:00 AM To 02:00 PM

Max. Marks: 70

- Instructions:** 1) All questions are compulsory.
2) Q.1 is objective type, return objective answer sheet to junior supervisor after first 40 minutes.
3) Retain all construction lines.
4) Assume suitable data if required and mention it.
5) All dimensions are in mm
6) Return all answer sheets to the junior supervisor irrespective of their use.
7) Figures to the right indicate full marks.

Section I

Q.1 Solve any FOUR: (Objective Type)

- a) Complete projections of Line AB, 70 mm long, having point B 50 mm above HRP, having bearing of S40E with respect to A. [Refer figure (a)] **03**
- b) Complete projections of Line PQ, having grade 60%. Find Bearing of Line. [Refer figure (b)] **03**
- c) Complete projections of Line PQ, perpendicular to Line AB. Find true length of PQ. [Refer figure (c)] **03**
- d) Find strike and Dip of Plane PQR [Refer figure (d)] **04**
- e) Complete projections of parallelogram ABCD. [Refer figure (e)] **03**
- f) Draw front view of plane ABC having strike of S60W and dips 45°NW. [Refer figure (f)] **04**

Q.2 Solve the following:

- a) A line MN has grade 75% w.r.t. M, its bearing w.r.t. M is S45°E and its front view length is 60 mm. Draw the projections of line MN and find its true angle with VP. Point M is 15 mm above H.P and 15 mm in front of VP. **04**
- b) Line AB, 50 mm long has bearing of S45°E and gradient of 100%. Draw its elevation and plan. Point A is 15 mm above HP and 15 mm in front of VP. **03**
- c) Find the inclination of triangular plane PQR with VP. The coordinates of the points are: P (30,50,110), Q (50,20,140), R (90,70,100) **04**

Q.3 A thin rectangular plate PQRS having sides PQ=RS=40 mm and QR= PS=70 mm is resting on one of its small sides PQ on HP. Its top view appears as square of sides 40 mm. Draw the projections of plate when PQ makes an angle of 40° with VP. **07**

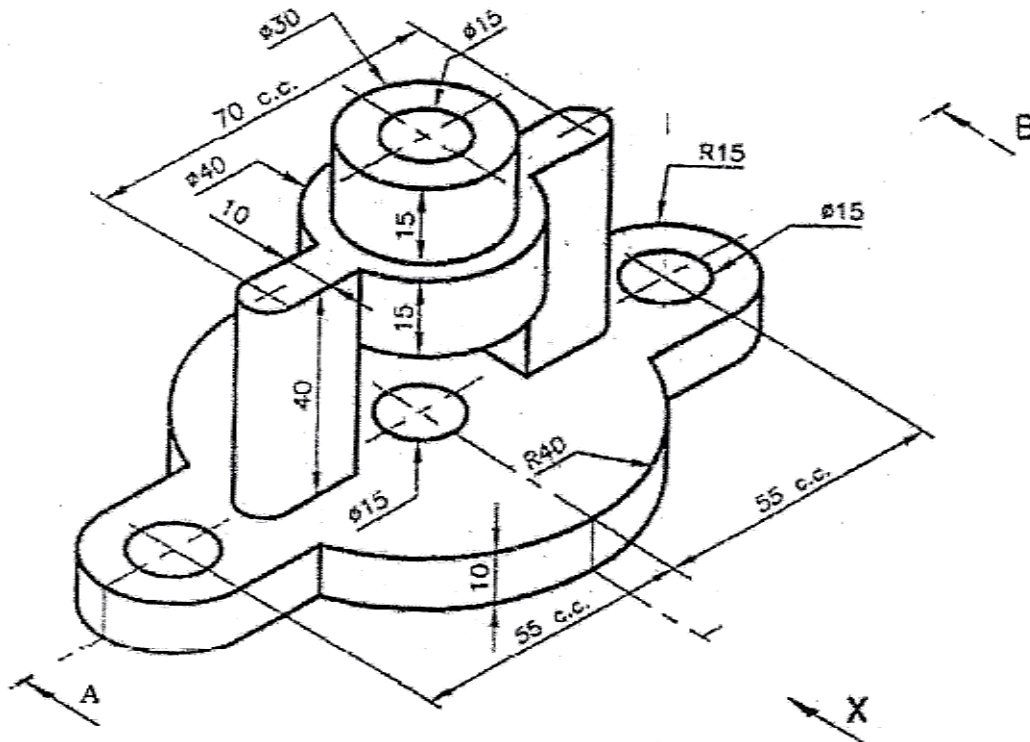
Q.4 A pentagonal prism side of base 50mm and height 80mm is held on a corner of its base on HP. The axis of the prism makes 50° with HP and 40° with VP. Draw the projections of the prism. **10**

OR

A square pyramid, side of base 40 mm and axis length 60 mm is kept on HP on one of its base corners, in such a way that its axis makes 30° with HP and 45° with VP. Draw the projections of the pyramid keeping apex away from the observer. **10**

Section II

- Q.5** Figure shows a pictorial view of an object. Draw following views by using first angle projection method **14**
- Sectional elevation in the direction of 'X' along A-B
 - Left hand side view
 - Plan

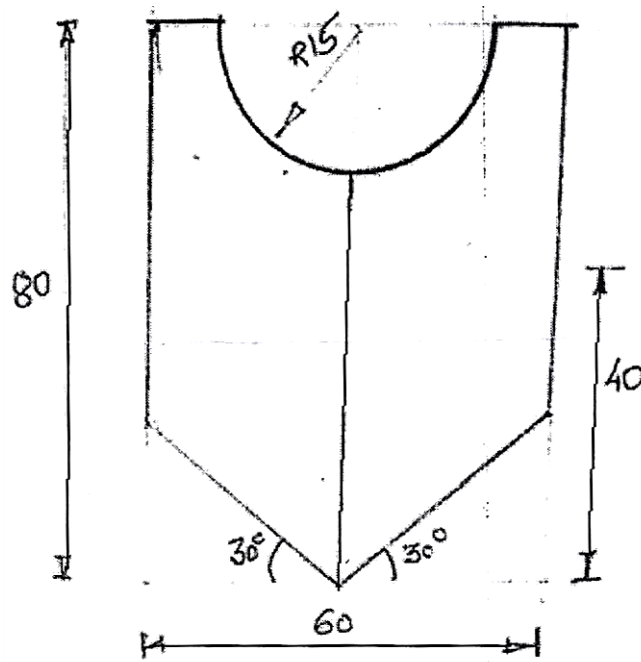


- Q.6** A tetrahedron with all sides 50mm rest on one of its corner in HP and tilts to have axis 45° to HP and parallel to VP. It is cut by section plane inclined to HP in such way that top view of section appears as trapezium with parallel sides 8mm and 36mm. Complete projection. Also find angle made by cutting plane with HP. **07**

OR

A cone of base circle diameter 50mm axis 75mm is lying on ground on one of its generator with its axis parallel to VP. It cut by horizontal section plane 20mm above ground. Draw Front view, sectional top view and true shape of section.

Q.7 Draw the development of lateral surfaces of cut hexagonal prism.



OR

A Hexagonal pyramid side of base 30 mm and axis 70 mm long is resting on base in HRP with a side parallel to FRP. It is cut by an auxiliary inclined plane passing through extreme right hand corner of base and inclined at 45° to HRP. Draw front view, top view and development of lateral surfaces of cut hexagonal pyramid.

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – I**

Day & Date: Friday, 06-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Use of non programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) If $y = \frac{x^n - 1}{x - 1}$ then $y_n =$ _____.

a) 0

b) $n!$

c) 1

d) $(n - 1)!$

2) If $y = 2^x x$ the $y_n =$ _____.

a) $2^x [(\log 2)^n + n(\log 2)^{n-3}]$ b) $2^x [(\log 2)^n + (\log 2)^{n-3}]$ c) $2^x [(\log 2)^n + n(\log 2)^{n-1}]$ d) $2^x [(\log 2)^n + (\log 2)^{n-1}]$

3) If $L = \lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$ then $L =$ _____.

a) $\frac{-1}{2}$ b) $-\log 2$ c) $e^{\frac{-1}{2}}$ d) -2

4) The expansion of $\log(1 - x) =$ _____.

a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$ b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$ c) $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$ d) $x - \frac{x^2}{2!} - \frac{x^3}{3!} - \frac{x^4}{4!} - \dots$

5) $\sinh^{-1} \frac{3}{4} =$ _____.

a) $\log 1$ b) $\log 2$ c) $\log 3$ d) $\log 4$

6) $\log(1 + i) =$ _____.

a) $\log 2 + i$ b) $\frac{1}{2} \log 2 - i \frac{\pi}{4}$ c) $\frac{1}{2} \log 2 + i \frac{\pi}{4}$ d) $\log 2 + i \frac{\pi}{4}$

7) If $x = e^{i\theta}$ and $y = e^{-i\theta}$ then $x^n - y^n =$ _____.

a) $\cos^n \theta + \sin^n \theta$ b) $2 \cos^n \theta$ c) $2 \cos n\theta$ d) $2i \sin n\theta$

- 8) If $k \neq 0$ then the rank of matrix A is where $A = \begin{pmatrix} k & k & k \\ k & k & k \\ k & k & k \end{pmatrix}$
- a) 2 b) k
 c) 0 d) 1
- 9) If rank of matrix $[A]_{3 \times 3}$ is 2, then the value of $|A| = \underline{\hspace{2cm}}$.
- a) 1 b) 0
 c) 2 d) -1
- 10) If the characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$ then ____.
- a) A^{-1} does not exist
 b) $A^{-1} = A + 1$
 c) A^{-1} exists but cannot be determined from existing data
 d) $A^{-1} = A - 1$
- 11) If 1, 1, 8 are eigen values and 5, 2, k are diagonal elements of matrix $[A]_{3 \times 3}$. then the value of K equals.
- a) 0 b) 1
 c) 2 d) 3
- 12) If $u = e^{xy^2z^3}$ then $\frac{\partial u}{\partial z} = \underline{\hspace{2cm}}$.
- a) $e^{xy^2z^3} xy^2z^3$ b) $e^{xy^2z^3} y^2z^3$
 c) $e^{xy^2z^3} 3xy^2z^2$ d) $e^{xy^2z^3} 2xyz^3$
- 13) If $(x, y, z) = 0$ then the value of $\frac{\partial z}{\partial x} = \underline{\hspace{2cm}}$.
- a) $\frac{\frac{\partial x}{\partial z}}{\frac{\partial z}{\partial y}}$ b) $\frac{\frac{\partial y}{\partial z}}{\frac{\partial z}{\partial x}}$
 c) $-\frac{\frac{\partial g}{\partial y}}{\frac{\partial g}{\partial z}}$ d) $-\frac{\frac{\partial g}{\partial x}}{\frac{\partial g}{\partial z}}$
- 14) The percentage error in the area of a circle when an error of 1% is made in measuring its radius is ____.
- a) 4 b) 3
 c) 2 d) 1

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019

Max. Marks: 56

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 5 & Q. No. 9 is compulsory. solve any two questions from each Section.

2) Use of non programmable calculator is allowed.

3) Figure to the right indicates full marks.

Section – I

Q.2 Attempt the following questions. 09

a) Find the nth derivative of $y = \frac{x-1}{x+1} + \sin x \cos x \cos 2x$

b) Find the nth derivative of $y = e^{-x} \cdot x \cdot \cos x$

c) If $y^{1/m} + y^{-1/m} = 2x$ then prove that

$$(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$$

Q.3 Attempt the following questions. 09

a) Expand $8 + 7(x + 2) + 6(x + 2)^2 + 5(x + 2)^3 + (x + 2)^4$ in powers of $(x + 1)$

b) Expand $\log(1 + e^x)$ in powers of x up to x^2 .

c) Find all the values of a, b, c if. $\lim_{x \rightarrow \infty} \frac{x(a + b \cos x) - c \sin x}{x^5} = 1$

Q.4 Attempt the following questions. 09

a) Prove that $(1 + i\sqrt{3})^8 + (1 - i\sqrt{3})^8 = -2^8$

b) Separate in to real and imaginary parts.

i) $\text{Log}(3 + 4i)$

ii) $\sqrt{i}^{\sqrt{i}}$

c) Find all the values of $(-1)^{1/6}$

Q.5 Attempt the following questions. 10

a) Separate into real and imaginary parts $\cos^{-1}\left(\frac{3i}{4}\right)$

b) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$ prove that

$$\phi = \frac{1}{2} \log \cot \alpha / 2$$

And

$$2\theta = n\pi + \frac{\pi}{2} + \alpha$$

c) If $u + iv = \cosh\left(\alpha + \frac{i\pi}{4}\right)$ Prove that $u^2 - v^2 = \frac{1}{2}$

Section – II

Q.6 Attempt the following questions.

09

a) Find the rank of the matrix by reducing it to Normal form

$$\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$$

b) Solve the equations

$$x + y - z + s = 0, x - y + 2z - s = 0, 3x + y + s = 0$$

c) Investigate for what value of μ and λ the equations.

$$2x + 3y + 5z = 9, 7x + 3y - 2z = 8, 2x + 3y + \lambda z = \mu \text{ will have}$$

- 1) No. solution
- 2) Infinite solutions
- 3) Unique solution

Q.7 Attempt the following questions.

09

a) Verify Cayley Hamilton theorem for A where

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

b) Find the Eigen Values and Eigen Vector for the Smallest Eigen Value for

$$A = \begin{pmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{pmatrix}$$

c) Examine the vector for Linear Dependence and Independence

$$[3, 1, 1], [2, 0, -1], [4, 2, 1]$$

Q.8 Attempt the following questions.

09

a) A rectangular box open at top is have volume 32 cubic unit. Find its dimensions if the material required is least.

b) Find the stationary value of $xy(1 - x - y)$ c) If $x = u \cos v, y = u \sin v$ prove that $J J' = 1$.

Q.9 Attempt the following questions.

10

a) If $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}} \right]$ then find the values of

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$$

and

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$$

b) If $u = lx + my$ and $v = ly - mx$ and z is function of u, v then prove that

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

c) If $u = (x^2 + y^2 + z^2)^{-1/2}$

$$\text{Find the value of } \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$$

Seat No.	
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Set **Q**

F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – I

Day & Date: Friday, 06-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
 - 2) Figures to the right indicate full marks.
 - 3) Use of non programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If $k \neq 0$ then the rank of matrix A is where $A = \begin{pmatrix} k & k & k \\ k & k & k \\ k & k & k \end{pmatrix}$
 - a) 2
 - b) k
 - c) 0
 - d) 1
- 2) If rank of matrix $[A]_{3 \times 3}$ is 2, then the value of $|A| = \underline{\hspace{2cm}}$.
 - a) 1
 - b) 0
 - c) 2
 - d) -1
- 3) If the characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$ then _____.
 - a) A^{-1} does not exists
 - b) $A^{-1} = A + 1$
 - c) A^{-1} exists but cannot be determine from existing data
 - d) $A^{-1} = A - 1$
- 4) If 1, 1, 8 are eigen values and 5, 2, k are diagonal elements of matrix $[A]_{3 \times 3}$. then the value of K equals.
 - a) 0
 - b) 1
 - c) 2
 - d) 3
- 5) If $u = e^{xy^2z^3}$ then $\frac{\partial u}{\partial z} = \underline{\hspace{2cm}}$.
 - a) $e^{xy^2z^3} xy^2z^3$
 - b) $e^{xy^2z^3} y^2z^3$
 - c) $e^{xy^2z^3} 3xy^2z^2$
 - d) $e^{xy^2z^3} 2xyz^3$
- 6) If $(x, y, z) = 0$ then the value of $\frac{\partial z}{\partial x} = \underline{\hspace{2cm}}$.
 - a) $\frac{\frac{\partial x}{\partial g}}{\frac{\partial z}{\partial y}}$
 - b) $\frac{\frac{\partial y}{\partial g}}{\frac{\partial x}{\partial g}}$
 - c) $-\frac{\frac{\partial g}{\partial y}}{\frac{\partial g}{\partial z}}$
 - d) $-\frac{\frac{\partial g}{\partial x}}{\frac{\partial g}{\partial z}}$

- 7) The percentage error in the area of a circle when an error of 1% is made in measuring its radius is _____.
- a) 4
b) 3
c) 2
d) 1
- 8) If $y = \frac{x^n - 1}{x - 1}$ then $y_n =$ _____.
- a) 0
b) $n!$
c) 1
d) $(n - 1)!$
- 9) If $y = 2^x$ then $y_n =$ _____.
- a) $2^x [(\log 2)^n + n(\log 2)^{n-3}]$
b) $2^x [(\log 2)^n + (\log 2)^{n-3}]$
c) $2^x [(\log 2)^n + n(\log 2)^{n-1}]$
d) $2^x [(\log 2)^n + (\log 2)^{n-1}]$
- 10) If $L = \lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$ then $L =$ _____.
- a) $\frac{-1}{2}$
b) $-\log 2$
c) $e^{\frac{-1}{2}}$
d) -2
- 11) The expansion of $\log(1 - x) =$ _____.
- a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$
b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$
c) $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$
d) $x - \frac{x^2}{2!} - \frac{x^3}{3!} - \frac{x^4}{4!} - \dots$
- 12) $\sinh^{-1} \frac{3}{4} =$ _____.
- a) $\log 1$
b) $\log 2$
c) $\log 3$
d) $\log 4$
- 13) $\log(1 + i) =$ _____.
- a) $\log 2 + i$
b) $\frac{1}{2} \log 2 - i \frac{\pi}{4}$
c) $\frac{1}{2} \log 2 + i \frac{\pi}{4}$
d) $\log 2 + i \frac{\pi}{4}$
- 14) If $x = e^{i\theta}$ and $y = e^{-i\theta}$ then $x^n - y^n =$ _____.
- a) $\cos^n \theta + \sin^n \theta$
b) $2 \cos^n \theta$
c) $2 \cos n\theta$
d) $2i \sin n\theta$

Seat
No.

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019

Max. Marks: 56

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 5 & Q. No. 9 is compulsory. solve any two questions from each Section.

2) Use of non programmable calculator is allowed.

3) Figure to the right indicates full marks.

Section – I

Q.2 Attempt the following questions. 09

a) Find the nth derivative of $y = \frac{x-1}{x+1} + \sin x \cos x \cos 2x$

b) Find the nth derivative of $y = e^{-x} \cdot x \cdot \cos x$

c) If $y^{1/m} + y^{-1/m} = 2x$ then prove that

$$(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$$

Q.3 Attempt the following questions. 09

a) Expand $8 + 7(x + 2) + 6(x + 2)^2 + 5(x + 2)^3 + (x + 2)^4$ in powers of $(x + 1)$

b) Expand $\log(1 + e^x)$ in powers of x up to x^2 .

c) Find all the values of a, b, c if $\lim_{x \rightarrow \infty} \frac{x(a + b \cos x) - c \sin x}{x^5} = 1$

Q.4 Attempt the following questions. 09

a) Prove that $(1 + i\sqrt{3})^8 + (1 - i\sqrt{3})^8 = -2^8$

b) Separate in to real and imaginary parts.

i) $\text{Log}(3 + 4i)$

ii) $\sqrt{i}^{\sqrt{i}}$

c) Find all the values of $(-1)^{1/6}$

Q.5 Attempt the following questions. 10

a) Separate into real and imaginary parts $\cos^{-1}\left(\frac{3i}{4}\right)$

b) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$ prove that

$$\phi = \frac{1}{2} \log \cot \alpha / 2$$

And

$$2\theta = n\pi + \frac{\pi}{2} + \alpha$$

c) If $u + iv = \cosh\left(\alpha + \frac{i\pi}{4}\right)$ Prove that $u^2 - v^2 = \frac{1}{2}$

Section – II

Q.6 Attempt the following questions.

09

- a) Find the rank of the matrix by reducing it to Normal form

$$\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$$

- b) Solve the equations

$$x + y - z + s = 0, x - y + 2z - s = 0, 3x + y + s = 0$$

- c) Investigate for what value of
- μ
- and
- λ
- the equations.

$$2x + 3y + 5z = 9, 7x + 3y - 2z = 8, 2x + 3y + \lambda z = \mu \text{ will have}$$

- 1) No. solution
- 2) Infinite solutions
- 3) Unique solution

Q.7 Attempt the following questions.

09

- a) Verify Cayley Hamilton theorem for A where

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

- b) Find the Eigen Values and Eigen Vector for the Smallest Eigen Value for

$$A = \begin{pmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{pmatrix}$$

- c) Examine the vector for Linear Dependence and Independence

$$[3, 1, 1], [2, 0, -1], [4, 2, 1]$$

Q.8 Attempt the following questions.

09

- a) A rectangular box open at top is have volume 32 cubic unit. Find its dimensions if the material required is least.
- b) Find the stationary value of $xy(1 - x - y)$
- c) If $x = u \cos v, y = u \sin v$ prove that $J J' = 1$.

Q.9 Attempt the following questions.

10

- a) If
- $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}} \right]$
- then find the values of

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$$

and

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$$

- b) If
- $u = lx + my$
- and
- $v = ly - mx$
- and
- z
- is function of
- u, v
- then prove that

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

- c) If
- $u = (x^2 + y^2 + z^2)^{-1/2}$

$$\text{Find the value of } \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$$

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – I**

Day & Date: Friday, 06-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Use of non programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) $\sinh^{-1} \frac{3}{4} = \underline{\hspace{2cm}}$.

a) $\log 1$	b) $\log 2$
c) $\log 3$	d) $\log 4$

- 2) $\log(1 + i) = \underline{\hspace{2cm}}$.

a) $\log 2 + i$	b) $\frac{1}{2} \log 2 - i \frac{\pi}{4}$
c) $\frac{1}{2} \log 2 + i \frac{\pi}{4}$	d) $\log 2 + i \frac{\pi}{4}$

- 3) If $x = e^{i\theta}$ and $y = e^{-i\theta}$ then $x^n - y^n = \underline{\hspace{2cm}}$.

a) $\cos^n \theta + \sin^n \theta$	b) $2 \cos^n \theta$
c) $2 \cos n\theta$	d) $2i \sin n\theta$

- 4) If $k \neq 0$ then the rank of matrix A is where $A = \begin{pmatrix} k & k & k \\ k & k & k \\ k & k & k \end{pmatrix}$

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

- 5) If rank of matrix $[A]_{3 \times 3}$ is 2, then the value of $|A| = \underline{\hspace{2cm}}$.

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

- 6) If the characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$ then _____.

a) A^{-1} does not exist
b) $A^{-1} = A + 1$
c) A^{-1} exists but cannot be determined from existing data
d) $A^{-1} = A - 1$

- 7) If 1, 1, 8 are eigen values and 5, 2, k are diagonal elements of matrix $[A]_{3 \times 3}$. then the value of K equals.

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

- 8) If $u = e^{xy^2z^3}$ then $\frac{\partial u}{\partial z} = \underline{\hspace{2cm}}$.

a) $e^{xy^2z^3} xy^2z^3$	b) $e^{xy^2z^3} y^2z^3$
c) $e^{xy^2z^3} 3xy^2z^2$	d) $e^{xy^2z^3} 2xyz^3$

- 9) If $(x, y, z) = 0$ then the value of $\frac{\partial z}{\partial x} =$ _____.
- | | |
|--|--|
| <p>a) $\frac{\frac{\partial x}{\partial z}}{\frac{\partial g}{\partial y}}$</p> <p>c) $-\frac{\frac{\partial g}{\partial y}}{\frac{\partial g}{\partial z}}$</p> | <p>b) $\frac{\frac{\partial y}{\partial x}}{\frac{\partial g}{\partial g}}$</p> <p>d) $-\frac{\frac{\partial g}{\partial x}}{\frac{\partial g}{\partial z}}$</p> |
|--|--|
- 10) The percentage error in the area of a circle when an error of 1% is made in measuring its radius is _____.
- | | |
|------|------|
| a) 4 | b) 3 |
| c) 2 | d) 1 |
- 11) If $y = \frac{x^n - 1}{x - 1}$ then $y_n =$ _____.
- | | |
|------|---------------|
| a) 0 | b) $n!$ |
| c) 1 | d) $(n - 1)!$ |
- 12) If $y = 2^x x$ the $y_n =$ _____.
- | | |
|---|--|
| a) $2^x [(\log 2)^n + n(\log 2)^{n-3}]$ | b) $2^x [(\log 2)^n + (\log 2)^{n-3}]$ |
| c) $2^x [(\log 2)^n + n(\log 2)^{n-1}]$ | d) $2^x [(\log 2)^n + (\log 2)^{n-1}]$ |
- 13) If $L = \lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$ then $L =$ _____.
- | | |
|-----------------------|--------------|
| a) $\frac{-1}{2}$ | b) $-\log 2$ |
| c) $e^{\frac{-1}{2}}$ | d) -2 |
- 14) The expansion of $\log(1 - x) =$ _____.
- | | |
|---|---|
| a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$ | b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$ |
| c) $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$ | d) $x - \frac{x^2}{2!} - \frac{x^3}{3!} - \frac{x^4}{4!} - \dots$ |

Seat
No.

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019

Max. Marks: 56

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 5 & Q. No. 9 is compulsory. solve any two questions from each Section.

2) Use of non programmable calculator is allowed.

3) Figure to the right indicates full marks.

Section – I

Q.2 Attempt the following questions. 09

a) Find the nth derivative of $y = \frac{x-1}{x+1} + \sin x \cos x \cos 2x$

b) Find the nth derivative of $y = e^{-x} \cdot x \cdot \cos x$

c) If $y^{1/m} + y^{-1/m} = 2x$ then prove that

$$(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$$

Q.3 Attempt the following questions. 09

a) Expand $8 + 7(x + 2) + 6(x + 2)^2 + 5(x + 2)^3 + (x + 2)^4$ in powers of $(x + 1)$

b) Expand $\log(1 + e^x)$ in powers of x up to x^2 .

c) Find all the values of a, b, c if. $\lim_{x \rightarrow \infty} \frac{x(a + b \cos x) - c \sin x}{x^5} = 1$

Q.4 Attempt the following questions. 09

a) Prove that $(1 + i\sqrt{3})^8 + (1 - i\sqrt{3})^8 = -2^8$

b) Separate in to real and imaginary parts.

i) $\text{Log}(3 + 4i)$

ii) $\sqrt{i}^{\sqrt{i}}$

c) Find all the values of $(-1)^{1/6}$

Q.5 Attempt the following questions. 10

a) Separate into real and imaginary parts $\cos^{-1}\left(\frac{3i}{4}\right)$

b) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$ prove that

$$\phi = \frac{1}{2} \log \cot \alpha / 2$$

And

$$2\theta = n\pi + \frac{\pi}{2} + \alpha$$

c) If $u + iv = \cosh\left(\alpha + \frac{i\pi}{4}\right)$ Prove that $u^2 - v^2 = \frac{1}{2}$

Section – II

Q.6 Attempt the following questions.

09

a) Find the rank of the matrix by reducing it to Normal form

$$\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$$

b) Solve the equations

$$x + y - z + s = 0, x - y + 2z - s = 0, 3x + y + s = 0$$

c) Investigate for what value of μ and λ the equations.

$$2x + 3y + 5z = 9, 7x + 3y - 2z = 8, 2x + 3y + \lambda z = \mu \text{ will have}$$

- 1) No. solution
- 2) Infinite solutions
- 3) Unique solution

Q.7 Attempt the following questions.

09

a) Verify Cayley Hamilton theorem for A where

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

b) Find the Eigen Values and Eigen Vector for the Smallest Eigen Value for

$$A = \begin{pmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{pmatrix}$$

c) Examine the vector for Linear Dependence and Independence

$$[3, 1, 1], [2, 0, -1], [4, 2, 1]$$

Q.8 Attempt the following questions.

09

a) A rectangular box open at top is have volume 32 cubic unit. Find its dimensions if the material required is least.

b) Find the stationary value of $xy(1 - x - y)$ c) If $x = u \cos v, y = u \sin v$ prove that $J J' = 1$.

Q.9 Attempt the following questions.

10

a) If $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}} \right]$ then find the values of

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$$

and

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$$

b) If $u = lx + my$ and $v = ly - mx$ and z is function of u, v then prove that

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

c) If $u = (x^2 + y^2 + z^2)^{-1/2}$

$$\text{Find the value of } \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$$

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – I**

Day & Date: Friday, 06-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.
3) Use of non programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- If the characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$ then _____.
 - A^{-1} does not exist
 - $A^{-1} = A + 1$
 - A^{-1} exists but cannot be determined from existing data
 - $A^{-1} = A - 1$
- If 1, 1, 8 are eigen values and 5, 2, k are diagonal elements of matrix $[A]_{3 \times 3}$, then the value of k equals.
 - 0
 - 2
 - 1
 - 3
- If $u = e^{xy^2z^3}$ then $\frac{\partial u}{\partial z} =$ _____.
 - $e^{xy^2z^3} xy^2z^3$
 - $e^{xy^2z^3} y^2z^3$
 - $e^{xy^2z^3} 3xy^2z^2$
 - $e^{xy^2z^3} 2xyz^3$
- If $(x, y, z) = 0$ then the value of $\frac{\partial z}{\partial x} =$ _____.
 - $\frac{\frac{\partial x}{\partial z}}{\frac{\partial y}{\partial z}}$
 - $\frac{\frac{\partial y}{\partial x}}{\frac{\partial x}{\partial g}}$
 - $-\frac{\frac{\partial g}{\partial y}}{\frac{\partial g}{\partial z}}$
 - $-\frac{\frac{\partial x}{\partial g}}{\frac{\partial g}{\partial z}}$
- The percentage error in the area of a circle when an error of 1% is made in measuring its radius is _____.
 - 4
 - 2
 - 3
 - 1
- If $y = \frac{x^n - 1}{x - 1}$ then $y_n =$ _____.
 - 0
 - 1
 - $n!$
 - $(n - 1)!$
- If $y = 2^x x$ the $y_n =$ _____.
 - $2^x [(\log 2)^n + n(\log 2)^{n-3}]$
 - $2^x [(\log 2)^n + (\log 2)^{n-3}]$
 - $2^x [(\log 2)^n + n(\log 2)^{n-1}]$
 - $2^x [(\log 2)^n + (\log 2)^{n-1}]$

- 8) If $L = \lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$ then $L =$ _____.
- a) $\frac{-1}{2}$ b) $-\log 2$
- c) $e^{\frac{-1}{2}}$ d) -2
- 9) The expansion of $\log(1-x) =$ _____.
- a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$ b) $-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$
- c) $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$ d) $x - \frac{x^2}{2!} - \frac{x^3}{3!} - \frac{x^4}{4!} - \dots$
- 10) $\sinh^{-1} \frac{3}{4} =$ _____.
- a) $\log 1$ b) $\log 2$
- c) $\log 3$ d) $\log 4$
- 11) $\log(1+i) =$ _____.
- a) $\log 2 + i$ b) $\frac{1}{2} \log 2 - i \frac{\pi}{4}$
- c) $\frac{1}{2} \log 2 + i \frac{\pi}{4}$ d) $\log 2 + i \frac{\pi}{4}$
- 12) If $x = e^{i\theta}$ and $y = e^{-i\theta}$ then $x^n - y^n =$ _____.
- a) $\cos^n \theta + \sin^n \theta$ b) $2 \cos^n \theta$
- c) $2 \cos n\theta$ d) $2i \sin n\theta$
- 13) If $k \neq 0$ then the rank of matrix A is where $A = \begin{pmatrix} k & k & k \\ k & k & k \\ k & k & k \end{pmatrix}$
- a) 2 b) k
- c) 0 d) 1
- 14) If rank of matrix $[A]_{3 \times 3}$ is 2, then the value of $|A| =$ _____.
- a) 1 b) 0
- c) 2 d) -1

Seat
No.

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - I**

Day & Date: Friday, 06-12-2019

Max. Marks: 56

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 5 & Q. No. 9 is compulsory. solve any two questions from each Section.

2) Use of non programmable calculator is allowed.

3) Figure to the right indicates full marks.

Section – I

Q.2 Attempt the following questions. 09

a) Find the nth derivative of $y = \frac{x-1}{x+1} + \sin x \cos x \cos 2x$

b) Find the nth derivative of $y = e^{-x} \cdot x \cdot \cos x$

c) If $y^{1/m} + y^{-1/m} = 2x$ then prove that

$$(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$$

Q.3 Attempt the following questions. 09

a) Expand $8 + 7(x + 2) + 6(x + 2)^2 + 5(x + 2)^3 + (x + 2)^4$ in powers of $(x + 1)$

b) Expand $\log(1 + e^x)$ in powers of x up to x^2 .

c) Find all the values of a, b, c if $\lim_{x \rightarrow \infty} \frac{x(a + b \cos x) - c \sin x}{x^5} = 1$

Q.4 Attempt the following questions. 09

a) Prove that $(1 + i\sqrt{3})^8 + (1 - i\sqrt{3})^8 = -2^8$

b) Separate in to real and imaginary parts.

i) $\text{Log}(3 + 4i)$

ii) $\sqrt{i}^{\sqrt{i}}$

c) Find all the values of $(-1)^{1/6}$

Q.5 Attempt the following questions. 10

a) Separate into real and imaginary parts $\cos^{-1}\left(\frac{3i}{4}\right)$

b) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$ prove that

$$\phi = \frac{1}{2} \log \cot \alpha / 2$$

And

$$2\theta = n\pi + \frac{\pi}{2} + \alpha$$

c) If $u + iv = \cosh\left(\alpha + \frac{i\pi}{4}\right)$ Prove that $u^2 - v^2 = \frac{1}{2}$

Section – II

Q.6 Attempt the following questions.

09

- a) Find the rank of the matrix by reducing it to Normal form

$$\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$$

- b) Solve the equations

$$x + y - z + s = 0, x - y + 2z - s = 0, 3x + y + s = 0$$

- c) Investigate for what value of
- μ
- and
- λ
- the equations.

$$2x + 3y + 5z = 9, 7x + 3y - 2z = 8, 2x + 3y + \lambda z = \mu \text{ will have}$$

- 1) No. solution
- 2) Infinite solutions
- 3) Unique solution

Q.7 Attempt the following questions.

09

- a) Verify Cayley Hamilton theorem for A where

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

- b) Find the Eigen Values and Eigen Vector for the Smallest Eigen Value for

$$A = \begin{pmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{pmatrix}$$

- c) Examine the vector for Linear Dependence and Independence

$$[3, 1, 1], [2, 0, -1], [4, 2, 1]$$

Q.8 Attempt the following questions.

09

- a) A rectangular box open at top is have volume 32 cubic unit. Find its dimensions if the material required is least.
- b) Find the stationary value of $xy(1 - x - y)$
- c) If $x = u \cos v, y = u \sin v$ prove that $J J' = 1$.

Q.9 Attempt the following questions.

10

- a) If
- $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}} \right]$
- then find the values of

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$$

and

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$$

- b) If
- $u = lx + my$
- and
- $v = ly - mx$
- and
- z
- is function of
- u, v
- then prove that

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2) \left[\frac{\partial^2 z}{\partial p^2} + \frac{\partial^2 z}{\partial q^2} \right]$$

- c) If
- $u = (x^2 + y^2 + z^2)^{-1/2}$

$$\text{Find the value of } \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$$

Seat No.	
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Set

P

F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Composition of forces is nothing but _____.

a) splitting of forces	b) finding resultant forces
c) both a & b are correct	d) none of these
- 2) 1 Kg force is equal to _____.

a) 7.5 N	b) 8.91 N
c) 9.81 N	d) 8.55 N
- 3) Angle made by resultant of normal reaction and frictional force with vertical is called as _____.

a) angle of friction	b) angle of repose
c) both a & b	d) cone of friction
- 4) A couple produces _____.

a) translatory motion	b) rotational motion
c) both translation & rotation	d) no motion
- 5) A framed structure of triangular shape is _____.

a) perfect	b) imperfect
c) deficient	d) redundant
- 6) The geometrical center of lamina through which all area is supposed to be acting is called as _____.

a) center of gravity	b) center of mass
c) center of inertia	d) centroid
- 7) The M.I of a triangular section of base (b) & height (h) about on axis through it's base is given as _____.

a) $bh^3/12$	b) $bh^3/18$
c) $bh^3/36$	d) $bh^3/64$

- 8) If gravitational acceleration at any place is doubled then weight of body will be _____.
- | | |
|----------------|---------|
| a) $g/2$ | b) g |
| c) $\sqrt{2}g$ | d) $2g$ |
- 9) In a rectilinear motion all the particles in body _____.
- | | |
|---------------------------|-----------------------|
| a) have same displacement | b) have some velocity |
| c) have some acceleration | d) all of these |
- 10) D'Alembert's principle correlates _____.
- a) force, mass, velocity, and displacement
 - b) force, mass, and acceleration
 - c) force, time, mass and velocity
 - d) mass and velocity
- 11) Angular momentum is the product of _____.
- a) mass moment of inertia x angular velocity
 - b) mass moment of inertia x angular acceleration
 - c) mass normal of inertia x angular displacement
 - d) none of these
- 12) The time rate of doing work is known as _____.
- | | |
|----------------------|-------------------|
| a) potential energy | b) kinetic energy |
| c) rotational energy | d) power |
- 13) The bodies which regains their size and shape after impact are called _____.
- | | |
|-------------------|-----------------------------|
| a) plastic bodies | b) rigid bodies |
| c) elastic bodies | d) partially plastic bodied |
- 14) Impulse is measured in _____.
- | | |
|-----------------------|---------------------|
| a) $N - \text{sec}$ | b) N / sec |
| c) N / sec^2 | d) N |

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS**

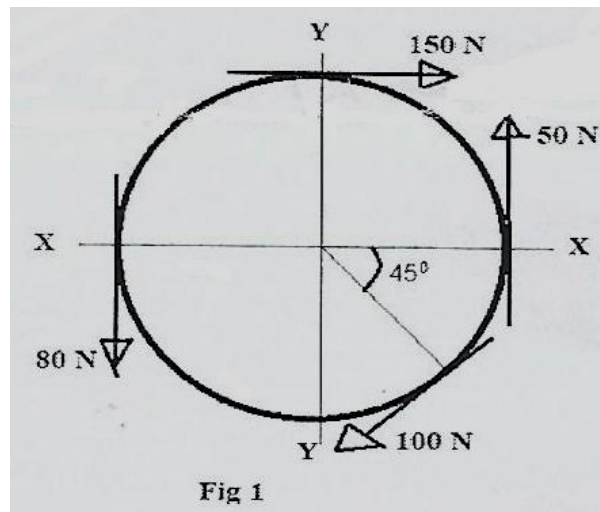
Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

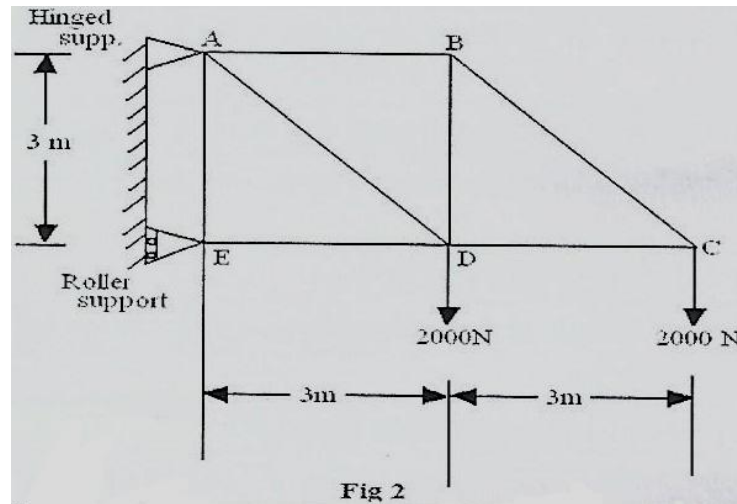
- Instructions:**
- 1) All questions are compulsory.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data if necessary and state it clearly.

Section – I

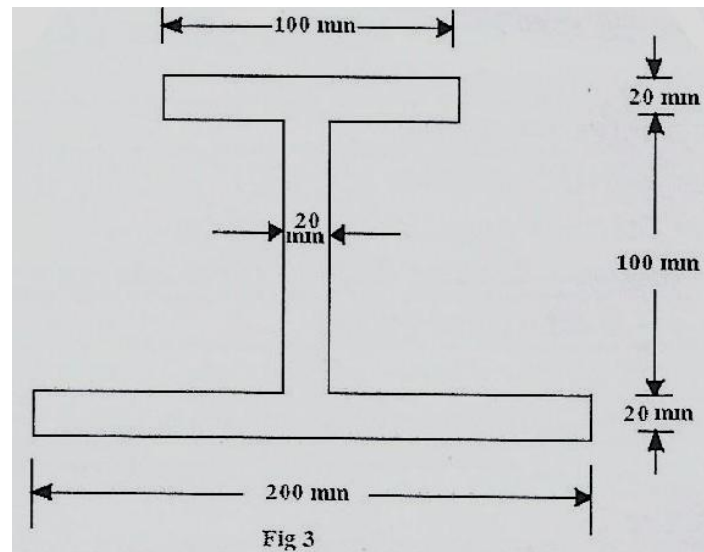
- Q.2 Attempt any four of the following questions. 12**
- a) State and prove the Varignon's theorem.
 - b) State and prove the Lami's theorem
 - c) Enlist different types of supports and explain any two with neat sketches.
 - d) Explain the concept of free body diagram with neat sketch.
 - e) What are the different types of trusses explain any two with neat sketches.
 - f) State and prove parallel axis theorem.
- Q.3 Attempt any two of the following questions. 16**
- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
- State and derive principle of work energy for linear motion
- State and explain principle of conservation of energy.

Q.5 Attempt any two of the following questions.

- a) A stone is dropped into a well is heard to strike the water after 6 seconds. Find depth of well, if the velocity of sound is 350 m/sec.
- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
- i) Acceleration of the system
 - ii) Tension in the string.
- Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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Set

Q

F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If gravitational acceleration at any place is doubled then weight of body will be _____.

a) $g/2$	b) g
c) $\sqrt{2}g$	d) $2g$
- 2) In a rectilinear motion all the particles in body _____.

a) have same displacement	b) have some velocity
c) have some acceleration	d) all of these
- 3) D'Alembert's principle correlates _____.

a) force, mass, velocity, and displacement
b) force, mass, and acceleration
c) force, time, mass and velocity
d) mass and velocity
- 4) Angular momentum is the product of _____.

a) mass moment of inertia x angular velocity
b) mass moment of inertia x angular acceleration
c) mass normal of inertia x angular displacement
d) none of these
- 5) The time rate of doing work is known as _____.

a) potential energy	b) kinetic energy
c) rotational energy	d) power
- 6) The bodies which regains their size and shape after impact are called _____.

a) plastic bodies	b) rigid bodies
c) elastic bodies	d) partially plastic bodied

- 7) Impulse is measured in _____.
a) $\text{N} - \text{sec}$
b) N / sec
c) N / sec^2
d) N
- 8) Composition of forces is nothing but _____.
a) splitting of forces
b) finding resultant forces
c) both a & b are correct
d) none of these
- 9) 1 Kg force is equal to _____.
a) 7.5 N
b) 8.91 N
c) 9.81 N
d) 8.55 N
- 10) Angle made by resultant of normal reaction and frictional force with vertical is called as _____.
a) angle of friction
b) angle of repose
c) both a & b
d) cone of friction
- 11) A couple produces _____.
a) translatory motion
b) rotational motion
c) both translation & rotation
d) no motion
- 12) A framed structure of triangular shape is _____.
a) perfect
b) imperfect
c) deficient
d) redundant
- 13) The geometrical center of lamina through which all area is supposed to be acting is called as _____.
a) center of gravity
b) center of mass
c) center of inertia
d) centroid
- 14) The M.I of a triangular section of base (b) & height (h) about on axis through it's base is given as _____.
a) $bh^3/12$
b) $bh^3/18$
c) $bh^3/36$
d) $bh^3/64$

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Set **Q**

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS**

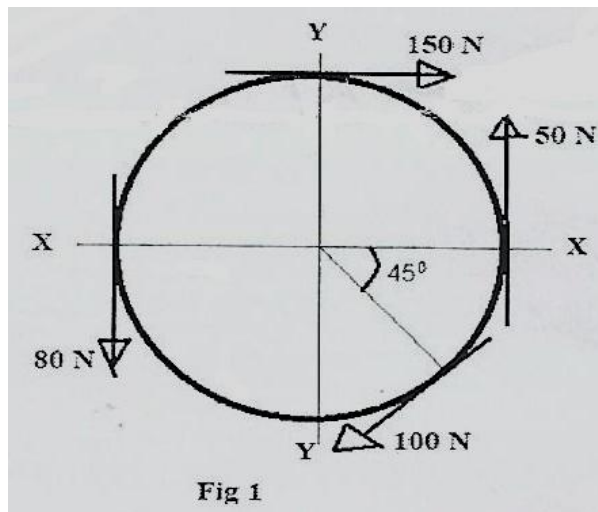
Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

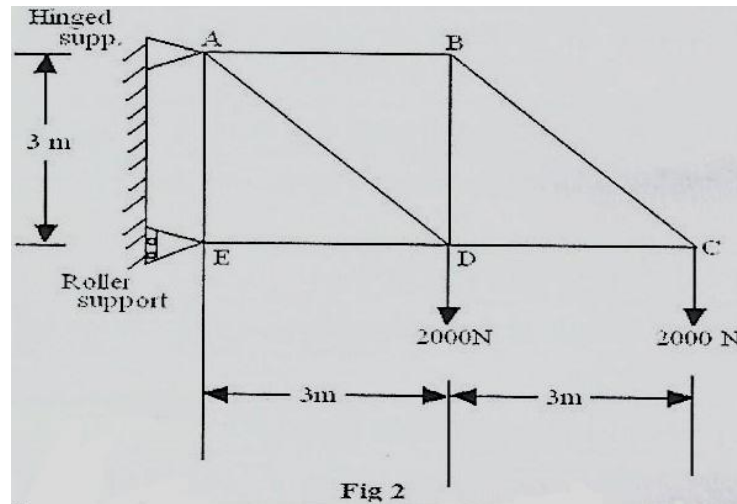
- Instructions:**
- 1) All questions are compulsory.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data if necessary and state it clearly.

Section – I

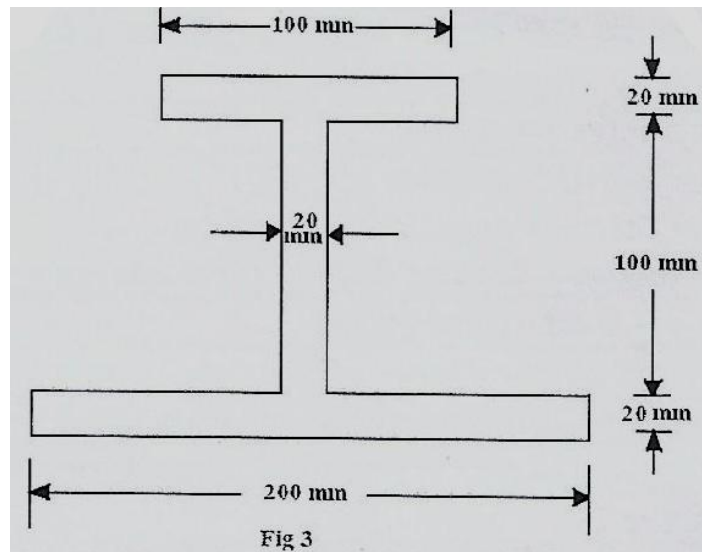
- Q.2 Attempt any four of the following questions. 12**
- a) State and prove the Varignon's theorem.
 - b) State and prove the Lami's theorem
 - c) Enlist different types of supports and explain any two with neat sketches.
 - d) Explain the concept of free body diagram with neat sketch.
 - e) What are the different types of trusses explain any two with neat sketches.
 - f) State and prove parallel axis theorem.
- Q.3 Attempt any two of the following questions. 16**
- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
- State and derive principle of work energy for linear motion
- State and explain principle of conservation of energy.

Q.5 Attempt any two of the following questions.

- a) A stone is dropped into a well is heard to strike the water after 6 seconds. Find depth of well, if the velocity of sound is 350 m/sec.
- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
i) Acceleration of the system
ii) Tension in the string.
Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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Set

R

F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.
 - 2) Use of non programmable scientific calculator allowed.
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 - 4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) A framed structure of triangular shape is _____.

a) perfect	b) imperfect
c) deficient	d) redundant

- 2) The geometrical center of lamina through which all area is supposed to be acting is called as _____.

a) center of gravity	b) center of mass
c) center of inertia	d) centroid

- 3) The M.I of a triangular section of base (b) & height (h) about on axis through it's base is given as _____.

a) $bh^3/12$	b) $bh^3/18$
c) $bh^3/36$	d) $bh^3/64$

- 4) If gravitational acceleration at any place is doubled then weight of body will be _____.

a) $g/2$	b) g
c) $\sqrt{2}g$	d) $2g$

- 5) In a rectilinear motion all the particles in body _____.

a) have same displacement	b) have some velocity
c) have some acceleration	d) all of these

- 6) D'Alembert's principle correlates _____.

a) force, mass, velocity, and displacement
b) force, mass, and acceleration
c) force, time, mass and velocity
d) mass and velocity

- 7) Angular momentum is the product of _____.
a) mass moment of inertia x angular velocity
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- 8) The time rate of doing work is known as _____.
a) potential energy
b) kinetic energy
c) rotational energy
d) power
- 9) The bodies which regains their size and shape after impact are called _____.
a) plastic bodies
b) rigid bodies
c) elastic bodies
d) partially plastic bodied
- 10) Impulse is measured in _____.
a) N – sec
b) N /sec
c) N/ sec²
d) N
- 11) Composition of forces is nothing but _____.
a) splitting of forces
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d) none of these
- 12) 1 Kg force is equal to _____.
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c) 9.81 N
d) 8.55 N
- 13) Angle made by resultant of normal reaction and frictional force with vertical is called as _____.
a) angle of friction
b) angle of repose
c) both a & b
d) cone of friction
- 14) A couple produces _____.
a) translatory motion
b) rotational motion
c) both translation & rotation
d) no motion

Seat No.	
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Set **R**

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS**

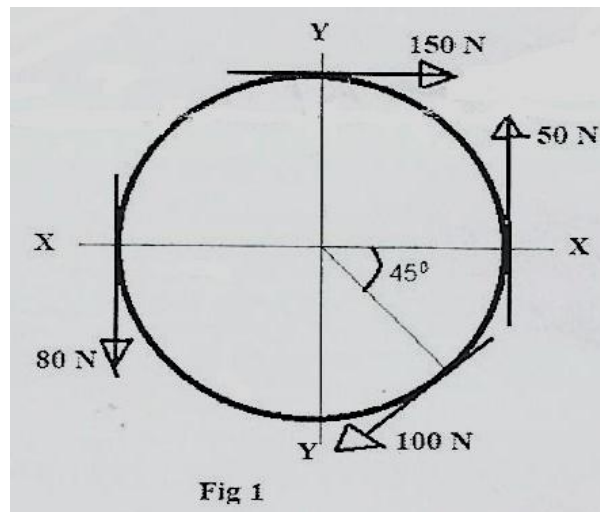
Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

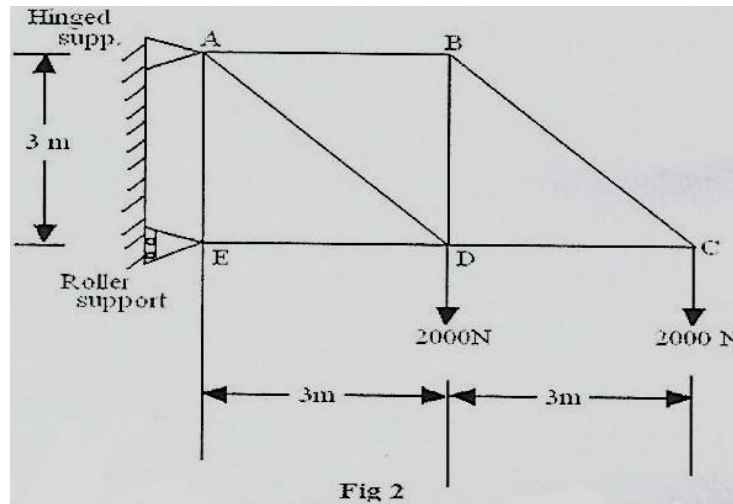
- Instructions:**
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 - 2) Use of non programmable scientific calculator allowed.
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Section – I

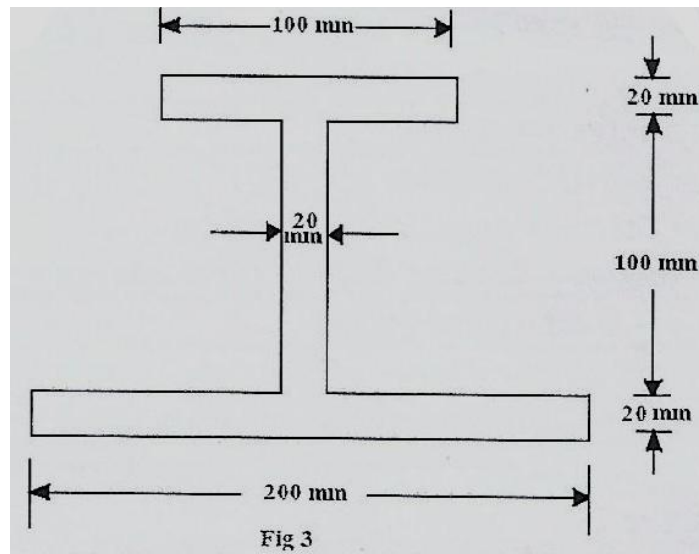
- Q.2 Attempt any four of the following questions. 12**
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 - b) State and prove the Lami's theorem
 - c) Enlist different types of supports and explain any two with neat sketches.
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- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
- State and derive principle of work energy for linear motion
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- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
i) Acceleration of the system
ii) Tension in the string.
Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) D'Alembert's principle correlates _____.
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 - b) force, mass, and acceleration
 - c) force, time, mass and velocity
 - d) mass and velocity

- 2) Angular momentum is the product of _____.
 - a) mass moment of inertia x angular velocity
 - b) mass moment of inertia x angular acceleration
 - c) mass normal of inertia x angular displacement
 - d) none of these

- 3) The time rate of doing work is known as _____.

a) potential energy	b) kinetic energy
c) rotational energy	d) power

- 4) The bodies which regains their size and shape after impact are called _____.

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- 5) Impulse is measured in _____.

a) N – sec	b) N /sec
c) N/ sec ²	d) N

- 6) Composition of forces is nothing but _____.

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b) 8.91 N
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- 13) If gravitational acceleration at any place is doubled then weight of body will be _____.
a) $g/2$
b) g
c) $\sqrt{2}g$
d) $2g$
- 14) In a rectilinear motion all the particles in body _____.
a) have same displacement
b) have some velocity
c) have some acceleration
d) all of these

Seat No.	
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Set **S**

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
APPLIED MECHANICS**

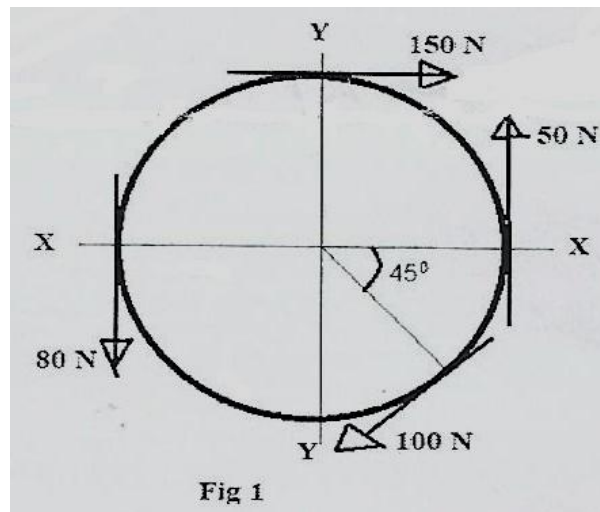
Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

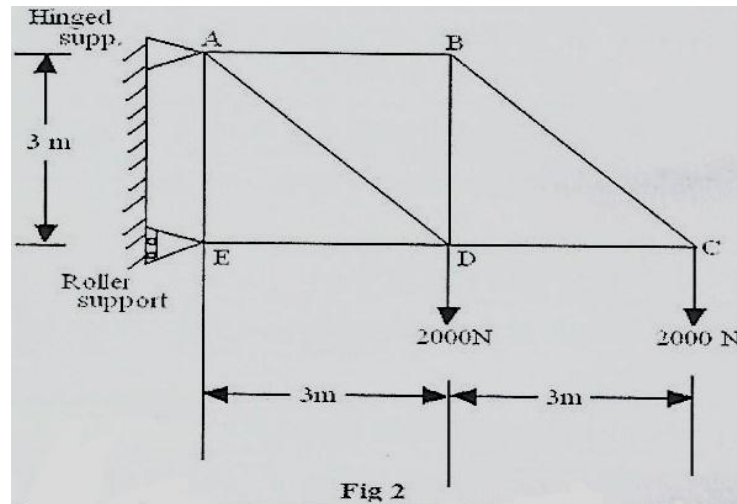
- Instructions:**
- 1) All questions are compulsory.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
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Section – I

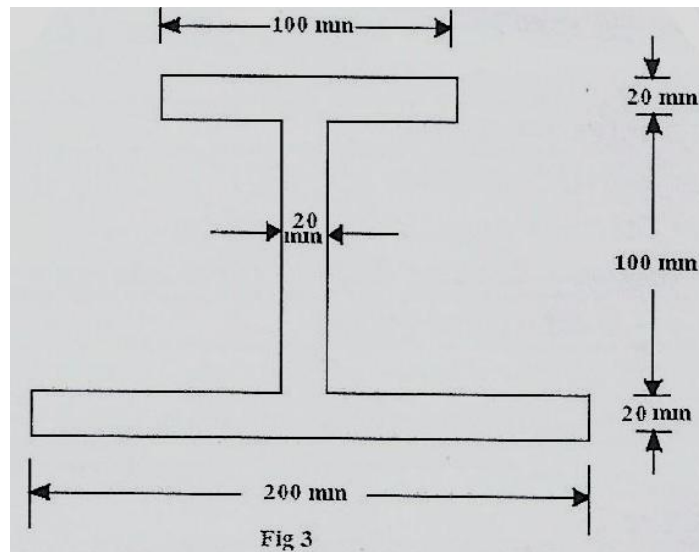
- Q.2 Attempt any four of the following questions. 12**
- a) State and prove the Varignon's theorem.
 - b) State and prove the Lami's theorem
 - c) Enlist different types of supports and explain any two with neat sketches.
 - d) Explain the concept of free body diagram with neat sketch.
 - e) What are the different types of trusses explain any two with neat sketches.
 - f) State and prove parallel axis theorem.
- Q.3 Attempt any two of the following questions. 16**
- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
- State and derive principle of work energy for linear motion
- State and explain principle of conservation of energy.

Q.5 Attempt any two of the following questions.

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- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
- i) Acceleration of the system
 - ii) Tension in the string.
- Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$

Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING

Day & Date: Wednesday, 11-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
 2) Assume suitable data if necessary and mention it clearly.
 3) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If a network does not contain any energy source is called as _____.
 a) Bilateral network b) Unilateral network
 c) Active network d) Passive network
- 2) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.
 a) 80 b) 77
 c) 77.5 d) 100
- 3) Joule's law of electrical heating is given by _____.
 a) $H = I^2 R t / J$ b) $H = I R t / J$
 c) $H = I^2 R / t J$ d) $H = I^2 J / R t$
- 4) A 25 W, 220V bulb and a 100 W. 220V bulb are joined in parallel and connected to 220V supply. Which bulb will glow more brightly?
 a) 25 W bulb
 b) 100 W bulb
 c) Both will glow with same brightness
 d) Neither bulb will glow
- 5) The value of magnetic field strength required to wipe out the residual flux density is called as _____.
 a) Retentivity b) Demagnetization
 c) Coercive force d) Hysteresis loop
- 6) If a sinusoidal wave has a frequency of 50Hz with 15 A rms value. Which of the following equations represent this wave?
 a) $15 \sin 50 t$ b) $30 \sin 314 t$
 c) $42.42 \sin 314 t$ d) $21.21 \sin 314 t$
- 7) Average value of full cycle of symmetrical AC waveform is _____.
 a) one b) 0.637
 c) zero d) 0.707
- 8) The impedance of purely capacitive circuit is given by _____.
 a) $z = R - jX_c$ b) $z = R + jX_c$
 c) $z = -jX_c$ d) $z = R$

Seat No.	
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Set	P
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

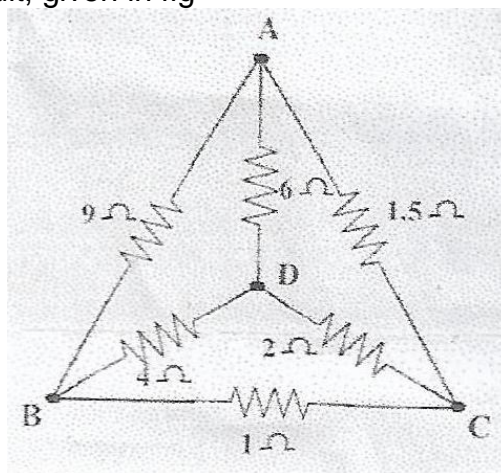
- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicates full marks.

Section – I

Q.2 Answer any four.

16

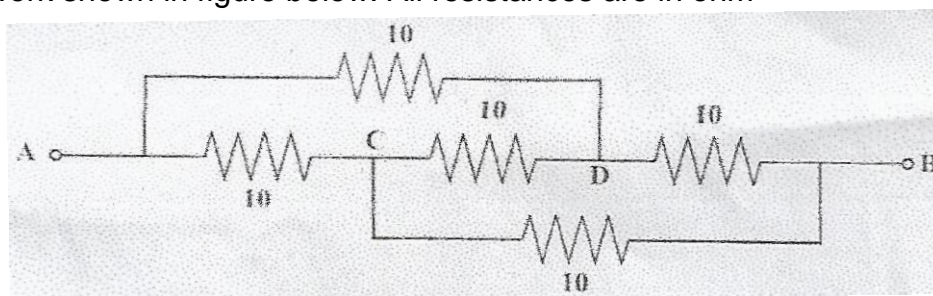
- a) A tungsten lamp filament has a temperature of 2050°C and a resistance of 500Ω when taking normal working current. Calculate the resistance of the filament when it has a temperature of 25°C. Temperature coefficient at 0°C is 0.005/°C.
- b) Define following terms:
 - 1) Cycle
 - 2) Time period
 - 3) Frequency
- c) Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- d) Derive an expression for rms value of an AC quantity.
- e) Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

- a) Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
- c) Three voltages are represented by $e_1 = 20 \sin(\omega t)$; $e_2 = 30 \sin(\omega t - \pi/4)$; $e_3 = 40 \cos(\omega t + \pi/6)$ volts act together in a circuit. Find an expression for the resultant voltage. Draw phasor diagram for $(e_1 + e_2 + e_3)$

Section – II

Q.4 Attempt any four.

16

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
 - 2) Resistance of the coil
 - 3) Inductance of the coil.
- c) Derive the relation between line and phase voltages & currents in balanced delta connected 3-phase load.
- d) Derive an expression for induced emf in a transformer in terms of frequency, maximum flux and the number of turns on the winding.
- e) A single phase, 50Hz transformer has 1000 primary turns and 400 secondary turns. The net cross-sectional area of the core is 60 cm^2 . If the primary induced EMF is 1250V, Find
- 1) Maximum flux density in the core
 - 2) emf induced in the secondary

Q.5 Attempt any two.

12

- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
- 1) Efficiency at full load, 0.8 lagging p.f
 - 2) KVA supplied at maximum efficiency
 - 3) Maximum efficiency at 0.8 lagging p.f
- b) Discuss the different types of DC motor with suitable circuit diagram, voltage equation and applications.
- c) A choking coil and a pure resistor are connected in series across a supply of 230 V, 50 Hz. The voltage drop across the resistor is 100 V and that across the choking coil is 150 V. Find voltage drop across the inductance and resistance of the choking coil. Find resistance & Inductance if current is 1 A.

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The impedance of purely capacitive circuit is given by _____.
 - a) $z = R - jX_c$
 - b) $z = R + jX_c$
 - c) $z = -jX_c$
 - d) $z = R$

- 2) The average power in R-L series circuit is given by _____.
 - a) $V_{rms} I_{rms} \cos \phi$
 - b) $V_{rms} I_{rms}$
 - c) Zero
 - d) $V_{rms} I_{rms} \sin \phi$

- 3) Three identical resistances connected in star consume 4000w. If these three resistances are connected in delta across the same supply, the power consumed will be _____.
 - a) 4000W
 - b) 6000W
 - c) 8000W
 - d) 12000W

- 4) For a balanced three phase system the total power consumed is given by _____.
 - a) $\sqrt{3} V_{ph} I_{ph} \cos \phi$
 - b) $V_{ph} I_{ph} \cos \phi$
 - c) $\sqrt{3} V_{LL} I_{LL} \cos \phi$
 - d) $3 V_{LL} I_{LL} \cos \phi$

- 5) The emf induced in a transformer depends upon _____.
 - a) Frequency
 - b) Number of turns
 - c) Maximum flux
 - d) All the above

- 6) A 2000/200V, 20 KVA ideal transformer has 66 turns in the secondary. The number of primary turns is _____.
 - a) 440
 - b) 660
 - c) 550
 - d) 330

- 7) When the load is removed the motor that will run at the highest speed is the _____.
 - a) Shunt
 - b) Series
 - c) Cumulative compound
 - d) Differentially compound

- 8) If a network does not contain any energy source is called as _____.
 - a) Bilateral network
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- 9) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.
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- 10) Joule's law of electrical heating is given by _____.
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Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

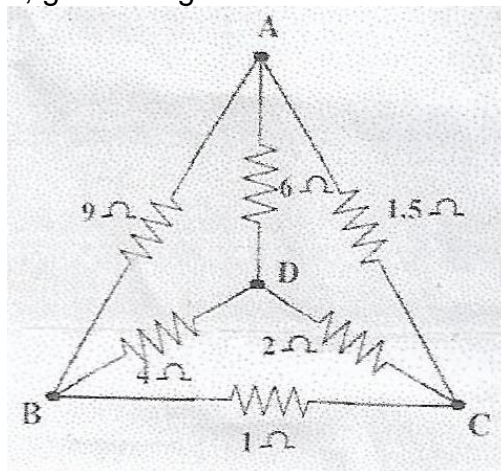
- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicates full marks.

Section – I

Q.2 Answer any four.

16

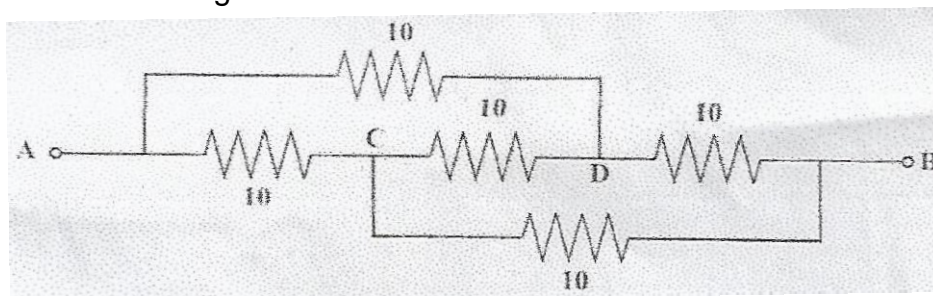
- a) A tungsten lamp filament has a temperature of 2050°C and a resistance of 500Ω when taking normal working current. Calculate the resistance of the filament when it has a temperature of 25°C. Temperature coefficient at 0°C is 0.005/°C.
- b) Define following terms:
 - 1) Cycle
 - 2) Time period
 - 3) Frequency
- c) Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- d) Derive an expression for rms value of an AC quantity.
- e) Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

- a) Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
- c) Three voltages are represented by $e_1 = 20 \sin(\omega t)$; $e_2 = 30 \sin(\omega t - \pi/4)$; $e_3 = 40 \cos(\omega t + \pi/6)$ volts act together in a circuit. Find an expression for the resultant voltage. Draw phasor diagram for $(e_1 + e_2 + e_3)$

Section – II

Q.4 Attempt any four. **16**

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
 - 2) Resistance of the coil
 - 3) Inductance of the coil.
- c) Derive the relation between line and phase voltages & currents in balanced delta connected 3-phase load.
- d) Derive an expression for induced emf in a transformer in terms of frequency, maximum flux and the number of turns on the winding.
- e) A single phase, 50Hz transformer has 1000 primary turns and 400 secondary turns. The net cross-sectional area of the core is 60 cm^2 . If the primary induced EMF is 1250V, Find
- 1) Maximum flux density in the core
 - 2) emf induced in the secondary

Q.5 Attempt any two. **12**

- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
- 1) Efficiency at full load, 0.8 lagging p.f
 - 2) KVA supplied at maximum efficiency
 - 3) Maximum efficiency at 0.8 lagging p.f
- b) Discuss the different types of DC motor with suitable circuit diagram, voltage equation and applications.
- c) A choking coil and a pure resistor are connected in series across a supply of 230 V, 50 Hz. The voltage drop across the resistor is 100 V and that across the choking coil is 150 V. Find voltage drop across the inductance and resistance of the choking coil. Find resistance & Inductance if current is 1 A.

Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING

Day & Date: Wednesday, 11-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
 2) Assume suitable data if necessary and mention it clearly.
 3) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The value of magnetic field strength required to wipe out the residual flux density is called as _____.
 a) Retentivity
 b) Demagnetization
 c) Coercive force
 d) Hysteresis loop
- 2) If a sinusoidal wave has a frequency of 50Hz with 15 A rms value. Which of the following equations represent this wave?
 a) $15 \sin 50 t$
 b) $30 \sin 314 t$
 c) $42.42 \sin 314 t$
 d) $21.21 \sin 314 t$
- 3) Average value of full cycle of symmetrical AC waveform is _____.
 a) one
 b) 0.637
 c) zero
 d) 0.707
- 4) The impedance of purely capacitive circuit is given by _____.
 a) $z = R - jX_c$
 b) $z = R + jX_c$
 c) $z = -jX_c$
 d) $z = R$
- 5) The average power in R-L series circuit is given by _____.
 a) $V_{rms} I_{rms} \cos \phi$
 b) $V_{rms} I_{rms}$
 c) Zero
 d) $V_{rms} I_{rms} \sin \phi$
- 6) Three identical resistances connected in star consume 4000w. If these three resistances are connected in delta across the same supply, the power consumed will be _____.
 a) 4000W
 b) 6000W
 c) 8000W
 d) 12000W
- 7) For a balanced three phase system the total power consumed is given by _____.
 a) $\sqrt{3} V_{ph} I_{ph} \cos \phi$
 b) $V_{ph} I_{ph} \cos \phi$
 c) $\sqrt{3} V_{LL} I_{LL} \cos \phi$
 d) $3 V_{LL} I_{LL} \cos \phi$
- 8) The emf induced in a transformer depends upon _____.
 a) Frequency
 b) Number of turns
 c) Maximum flux
 d) All the above
- 9) A 2000/200V, 20 KVA ideal transformer has 66 turns in the secondary. The number of primary turns is _____.
 a) 440
 b) 660
 c) 550
 d) 330

- 10) When the load is removed the motor that will run at the highest speed is the _____.
a) Shunt b) Series
c) Cumulative compound d) Differentially compound
- 11) If a network does not contain any energy source is called as _____.
a) Bilateral network b) Unilateral network
c) Active network d) Passive network
- 12) How much of unit of electric energy consumed in operating ten 50 watt bulbs for 5 hours per day for December 2006? _____ units.
a) 80 b) 77
c) 77.5 d) 100
- 13) Joule's law of electrical heating is given by _____.
a) $H = I^2Rt/J$ b) $H = IRt/J$
c) $H = I^2R/tJ$ d) $H = I^2J/Rt$
- 14) A 25 W, 220V bulb and a 100 W. 220V bulb are joined in parallel and connected to 220V supply. Which bulb will glow more brightly?
a) 25 W bulb
b) 100 W bulb
c) Both will glow with same brightness
d) Neither bulb will glow

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

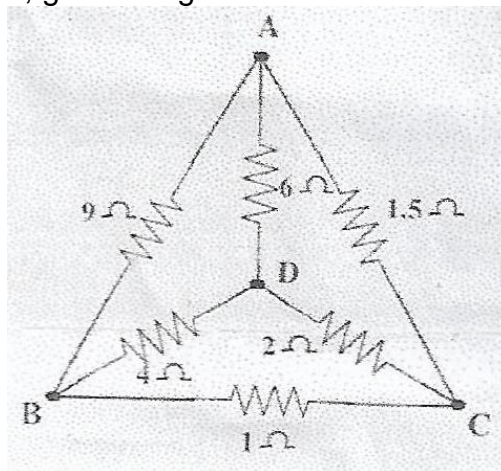
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Section – I

Q.2 Answer any four.

16

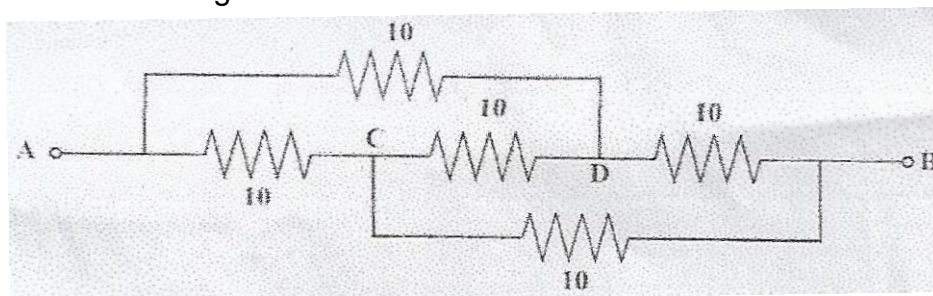
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- b) Define following terms:
 - 1) Cycle
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- c) Phase difference Define- MMF, magnetic flux density, magnetic field strength, reluctance.
- d) Derive an expression for rms value of an AC quantity.
- e) Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

- a) Calculate the equivalent resistance between the terminals A and B in the network shown in figure below. All resistances are in ohm



- b) A flux density of 1.2 T is required in 3 mm air gap of an electromagnet wound with 500 turns of wire and having an iron path of 125 cm. calculate the current required, assuming $\mu_r = 1000$ for iron and neglect leakage & fringing.
- c) Three voltages are represented by $e_1 = 20 \sin(\omega t)$; $e_2 = 30 \sin(\omega t - \pi/4)$; $e_3 = 40 \cos(\omega t + \pi/6)$ volts act together in a circuit. Find an expression for the resultant voltage. Draw phasor diagram for $(e_1 + e_2 + e_3)$

Section – II

Q.4 Attempt any four.

16

- a) Explain resonance in R-L-C series circuit.
- b) An inductor coil connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Calculate
- 1) Power Factor
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- c) Derive the relation between line and phase voltages & currents in balanced delta connected 3-phase load.
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12

- a) A 40 KVA single phase transformer has iron loss of 450W. The full load copper loss is 850 watts. Calculate
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Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING

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 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

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Duration: 30 Minutes

Marks: 14

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 - b) $V_{ph} I_{ph} \cos \phi$
 - c) $\sqrt{3} V_L I_L \cos \phi$
 - d) $3 V_L I_L \cos \phi$
- 3) The emf induced in a transformer depends upon _____.
 - a) Frequency
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 - c) Maximum flux
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 - b) $H = I R t / J$
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 - $V_{rms} I_{rms}$
 - Zero
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Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRICAL ENGINEERING**

Day & Date: Wednesday, 11-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

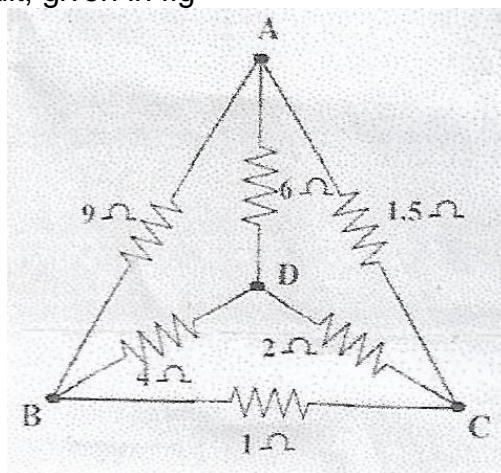
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Section – I

Q.2 Answer any four.

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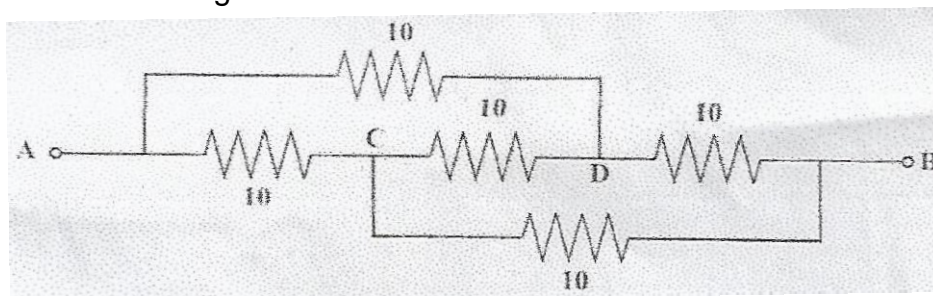
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- e) Find R_{AB} in the circuit, given in fig



Q.3 Attempt any two.

12

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Section – II

Q.4 Attempt any four.

16

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- 9) A condenser in a thermal power plant condenses steam coming out of _____.
- | | |
|---------------|-----------------|
| a) Boiler | b) Super-heater |
| c) Economizer | d) Turbine |
- 10) In a four stroke cycle engine, number of revolutions of the crankshaft for completion of working cycle is _____.
- | | |
|----------|---------|
| a) one | b) two |
| c) three | d) four |
- 11) Due to slip of belt, the velocity ratio of the belt drive _____.
- | | |
|---------------------|--------------|
| a) increase | b) decreases |
| c) remains constant | d) none |
- 12) Property of material, which enables it to regain its original shape after deformation, when the external forces are removed, is known as _____.
- | | |
|---------------|---------------|
| a) Elasticity | b) Plasticity |
| c) Ductility | d) Toughness |
- 13) Gear drive is used for transmitting power when two shafts are _____.
- | | |
|-------------|---------------------|
| a) Parallel | b) Intersecting |
| c) Skew | d) All of the above |
- 14) Which of the following is a mother of all the machine tools?
- | | |
|-------------|------------------|
| a) Milling | b) Lathe |
| c) Drilling | d) None of these |

Seat No.	
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**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

Day & Date: Friday, 13-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q.No.2 and Q.No.4 are short answer type question.
2) Q.No.3 and Q.No.5 long answer type question.
3) Neat diagram must be drawn whenever necessary.
4) Make suitable assumptions, if necessary and mention them clearly.
5) Use of log tables and non-programmable single memory calculator is allowed.

Section – I

Q.2 Answer any five of the following **15**

- State different statements of second law of thermodynamics.
- Compare BWR and PWR.
- Explain in brief point function and path function with suitable examples.
- Explain working of roots blower with neat sketch.
- Explain in brief working of double acting reciprocating pump.
- Explain the working of Vapour compression refrigeration cycle.
- Derive an expression for work done in adiabatic process.

Q.3 a) is compulsory. solve any two out of b) to e). **13**

- Steam enters a steam turbine with a velocity of 60 m/s and enthalpy of 2600 kJ/kg and leaves with a velocity of 100 m/s and enthalpy of 2150 kJ/kg. Heat lost from turbine to surrounding is 220kJ/min. Find power developed by turbine if steam flow rate is 5800 kg/hr. **05**
- A certain quantity of air has volume 0.028m³ at pressure of 1.25 bar and 25⁰C. It is compressed to volume of 0.0042 m³ according to law $PV^{1.3}=\text{Constant}$. Find final temperature and work done during compression. Also determine reduction in pressure at constant volume required to bring system to its original temperature. **04**
- A system undergoes a cycle consist of 4 processes. The heat and work transfer are tabulated below. Prove that the table is consistent with first law of thermodynamics. Determine network and find thermal efficiency. **04**

Process	Q(kJ)	W(kJ)
1-2	1770	565
2-3	-1650	0
3-4	-900	-305
4-1	1040	0

- Explain with neat sketch, construction and working of Pelton turbine. **04**
- Draw a neat sketch of steam power plant. Explain function of air-pre heater, economizer and super heater. **04**

Section – II

- Q.4 Answer any five of the following.** **15**
- a)** Show in the figure following terms associated with an I.C. engine.
- 1) Bore
 - 2) Stroke
 - 3) Top dead center (T.D.C.)
 - 4) Bottom dead center (B.D.C.)
 - 5) Clearance volume
 - 6) Swept volume
- b)** An air standard diesel cycle has a compression ratio of 16 and the heat transferred to the working fluid per cycle is 2000 KJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Calculate.-
Thermal efficiency
- c)** What are the different modes of transmission of mechanical power?
- d)** What is gear? Explain Worm and Worm wheel gear with neat sketch.
- e)** Explain the different modes of failure of mechanical components.
- f)** Write note on selection of material for engineering application.
- g)** Compress Electric arc welding with gas welding.
- Q.5 a) is compulsory and solve any two out of b) to d).** **13**
- a)** An engine working on Otto cycle has a compression ratio of 8. **05**
Compression begins at 100 KPa and 15°C. The heat supplied per cycle is 2000 KJ/kg of air. Determine.
- 1) Thermal efficiency
 - 2) Maximum Cycle temperature.
- b)** Draw block diagram of lathe machine. Explain turning operation in brief. **04**
- c)** In open belt drive, two pulleys of 500 mm diameter are connected at distance of 2 m apart. The initial tension in the belt is 500 N if the coefficient of friction between the belt and pulley is 0.25. Find the power transmitted at 700 rpm. Also calculate the length of belt. **04**
- d)** Explain aesthetic consideration in design of mechanical component. **04**

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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING

Day & Date: Friday, 13-12-2019
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Max. Marks: 70

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4) Make suitable assumptions, if necessary and mention them clearly.
5) Use of log tables and non-programmable single memory calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The penstock is used _____.
a) to increase pressure energy of water leaving to tailrace
b) to decrease pressure energy of water leaving to tailrace
c) to convey water from dam to turbine
d) None
- 2) A condenser in a thermal power plant condenses steam coming out of _____.
a) Boiler
b) Super-heater
c) Economizer
d) Turbine
- 3) In a four stroke cycle engine, number of revolutions of the crankshaft for completion of working cycle is _____.
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d) All of the above
- 7) Which of the following is a mother of all the machine tools?
a) Milling
b) Lathe
c) Drilling
d) None of these
- 8) A system comprising of a single phase, is known as _____.
a) open system
b) closed system
c) homogeneous system
d) heterogeneous system

- 9) For a closed system, the difference between the heat added to the system and work done by the gas, is equal to the change in _____.
- | | |
|--------------------|----------------|
| a) enthalpy | b) Entropy |
| c) internal energy | d) Temperature |
- 10) Heat-pump is used _____.
- | | |
|------------------------------|----------------------|
| a) to heat space | b) to cool the space |
| c) to convert heat into work | d) None |
- 11) Universal gas constant of perfect gas _____.
- | |
|--|
| a) increases with temperature |
| b) decreases with temperature |
| c) increases with increase in molecular weight |
| d) is always constant |
- 12) The internal energy of an ideal gas depends only on _____.
- | | |
|----------------|----------------------|
| a) pressure | b) Volume |
| c) temperature | d) none of the above |
- 13) Impeller is used in _____.
- | | |
|---------------------|----------------------|
| a) centrifugal pump | b) Engine |
| c) turbine | d) none of the above |
- 14) Following is the impulse type water turbine _____.
- | | |
|-------------------|--------------------|
| a) Pelton turbine | b) Francis turbine |
| c) Kaplan turbine | d) None |

Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING

Day & Date: Friday, 13-12-2019
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Section – I

- Q.2 Answer any five of the following** **15**
- a) State different statements of second law of thermodynamics.
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| 3-4 | -900 | -305 |
| 4-1 | 1040 | 0 |
- d) Explain with neat sketch, construction and working of Pelton turbine. **04**
 - e) Draw a neat sketch of steam power plant. Explain function of air-pre heater, economizer and super heater. **04**

Section – II

- Q.4 Answer any five of the following.** **15**
- a) Show in the figure following terms associated with an I.C. engine.
- 1) Bore
 - 2) Stroke
 - 3) Top dead center (T.D.C.)
 - 4) Bottom dead center (B.D.C.)
 - 5) Clearance volume
 - 6) Swept volume
- b) An air standard diesel cycle has a compression ratio of 16 and the heat transferred to the working fluid per cycle is 2000 KJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Calculate.-
Thermal efficiency
- c) What are the different modes of transmission of mechanical power?
- d) What is gear? Explain Worm and Worm wheel gear with neat sketch.
- e) Explain the different modes of failure of mechanical components.
- f) Write note on selection of material for engineering application.
- g) Compare Electric arc welding with gas welding.
- Q.5 a) is compulsory and solve any two out of b) to d).** **13**
- a) An engine working on Otto cycle has a compression ratio of 8. **05**
Compression begins at 100 KPa and 15°C. The heat supplied per cycle is 2000 KJ/kg of air. Determine.
- 1) Thermal efficiency
 - 2) Maximum Cycle temperature.
- b) Draw block diagram of lathe machine. Explain turning operation in brief. **04**
- c) In open belt drive, two pulleys of 500 mm diameter are connected at distance of 2 m apart. The initial tension in the belt is 500 N if the coefficient of friction between the belt and pulley is 0.25. Find the power transmitted at 700 rpm. Also calculate the length of belt. **04**
- d) Explain aesthetic consideration in design of mechanical component. **04**

Seat No.	
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Set

R

**F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING**

Day & Date: Friday, 13-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
 - 2) Neat diagrams must be drawn whenever necessary.
 - 3) Figures to the right indicate full marks.
 - 4) Make suitable assumptions, if necessary and mention them clearly.
 - 5) Use of log tables and non-programmable single memory calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The internal energy of an ideal gas depends only on _____.
 a) pressure b) Volume
 c) temperature d) none of the above
- 2) Impeller is used in _____.
 a) centrifugal pump b) Engine
 c) turbine d) none of the above
- 3) Following is the impulse type water turbine _____.
 a) Pelton turbine b) Francis turbine
 c) Kaplan turbine d) None
- 4) The penstock is used _____.
 a) to increase pressure energy of water leaving to tailrace
 b) to decrease pressure energy of water leaving to tailrace
 c) to convey water from dam to turbine
 d) None
- 5) A condenser in a thermal power plant condenses steam coming out of _____.
 a) Boiler b) Super-heater
 c) Economizer d) Turbine
- 6) In a four stroke cycle engine, number of revolutions of the crankshaft for completion of working cycle is _____.
 a) one b) two
 c) three d) four
- 7) Due to slip of belt, the velocity ratio of the belt drive _____.
 a) increase b) decreases
 c) remains constant d) none
- 8) Property of material, which enables it to regain its original shape after deformation, when the external forces are removed, is known as _____.
 a) Elasticity b) Plasticity
 c) Ductility d) Toughness

- 9) Gear drive is used for transmitting power when two shafts are _____.
a) Parallel b) Intersecting
c) Skew d) All of the above
- 10) Which of the following is a mother of all the machine tools?
a) Milling b) Lathe
c) Drilling d) None of these
- 11) A system comprising of a single phase, is known as _____.
a) open system b) closed system
c) homogeneous system d) heterogeneous system
- 12) For a closed system, the difference between the heat added to the system and work done by the gas, is equal to the change in _____.
a) enthalpy b) Entropy
c) internal energy d) Temperature
- 13) Heat-pump is used _____.
a) to heat space b) to cool the space
c) to convert heat into work d) None
- 14) Universal gas constant of perfect gas _____.
a) increases with temperature
b) decreases with temperature
c) increases with increase in molecular weight
d) is always constant

Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING

Day & Date: Friday, 13-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q.No.2 and Q.No.4 are short answer type question.
 2) Q.No.3 and Q.No.5 long answer type question.
 3) Neat diagram must be drawn whenever necessary.
 4) Make suitable assumptions, if necessary and mention them clearly.
 5) Use of log tables and non-programmable single memory calculator is allowed.

Section – I

- Q.2 Answer any five of the following** **15**
- a) State different statements of second law of thermodynamics.
 - b) Compare BWR and PWR.
 - c) Explain in brief point function and path function with suitable examples.
 - d) Explain working of roots blower with neat sketch.
 - e) Explain in brief working of double acting reciprocating pump.
 - f) Explain the working of Vapour compression refrigeration cycle.
 - g) Derive an expression for work done in adiabatic process.
- Q.3 a) is compulsory. solve any two out of b) to e).** **13**
- a) Steam enters a steam turbine with a velocity of 60 m/s and enthalpy of 2600 kJ/kg and leaves with a velocity of 100 m/s and enthalpy of 2150 kJ/kg. Heat lost from turbine to surrounding is 220kJ/min. Find power developed by turbine if steam flow rate is 5800 kg/hr. **05**
 - b) A certain quantity of air has volume 0.028m³ at pressure of 1.25 bar and 25⁰C. It is compressed to volume of 0.0042 m³ according to law $PV^{1.3}=\text{Constant}$. Find final temperature and work done during compression. Also determine reduction in pressure at constant volume required to bring system to its original temperature. **04**
 - c) A system undergoes a cycle consist of 4 processes. The heat and work transfer are tabulated below. Prove that the table is consistent with first law of thermodynamics. Determine network and find thermal efficiency. **04**
- | Process | Q(kJ) | W(kJ) |
|---------|-------|-------|
| 1-2 | 1770 | 565 |
| 2-3 | -1650 | 0 |
| 3-4 | -900 | -305 |
| 4-1 | 1040 | 0 |
- d) Explain with neat sketch, construction and working of Pelton turbine. **04**
 - e) Draw a neat sketch of steam power plant. Explain function of air-pre heater, economizer and super heater. **04**

Section – II

- Q.4 Answer any five of the following.** **15**
- a) Show in the figure following terms associated with an I.C. engine.
- 1) Bore
 - 2) Stroke
 - 3) Top dead center (T.D.C.)
 - 4) Bottom dead center (B.D.C.)
 - 5) Clearance volume
 - 6) Swept volume
- b) An air standard diesel cycle has a compression ratio of 16 and the heat transferred to the working fluid per cycle is 2000 KJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Calculate.-
Thermal efficiency
- c) What are the different modes of transmission of mechanical power?
- d) What is gear? Explain Worm and Worm wheel gear with neat sketch.
- e) Explain the different modes of failure of mechanical components.
- f) Write note on selection of material for engineering application.
- g) Compare Electric arc welding with gas welding.
- Q.5 a) is compulsory and solve any two out of b) to d).** **13**
- a) An engine working on Otto cycle has a compression ratio of 8. **05**
Compression begins at 100 KPa and 15°C. The heat supplied per cycle is 2000 KJ/kg of air. Determine.
- 1) Thermal efficiency
 - 2) Maximum Cycle temperature.
- b) Draw block diagram of lathe machine. Explain turning operation in brief. **04**
- c) In open belt drive, two pulleys of 500 mm diameter are connected at distance of 2 m apart. The initial tension in the belt is 500 N if the coefficient of friction between the belt and pulley is 0.25. Find the power transmitted at 700 rpm. Also calculate the length of belt. **04**
- d) Explain aesthetic consideration in design of mechanical component. **04**

Seat No.	
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Set **S**

F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING

Day & Date: Friday, 13-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Neat diagrams must be drawn whenever necessary.
3) Figures to the right indicate full marks.
4) Make suitable assumptions, if necessary and mention them clearly.
5) Use of log tables and non-programmable single memory calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) In a four stroke cycle engine, number of revolutions of the crankshaft for completion of working cycle is _____.
a) one b) two
c) three d) four
- 2) Due to slip of belt, the velocity ratio of the belt drive _____.
a) increase b) decreases
c) remains constant d) none
- 3) Property of material, which enables it to regain its original shape after deformation, when the external forces are removed, is known as _____.
a) Elasticity b) Plasticity
c) Ductility d) Toughness
- 4) Gear drive is used for transmitting power when two shafts are _____.
a) Parallel b) Intersecting
c) Skew d) All of the above
- 5) Which of the following is a mother of all the machine tools?
a) Milling b) Lathe
c) Drilling d) None of these
- 6) A system comprising of a single phase, is known as _____.
a) open system b) closed system
c) homogeneous system d) heterogeneous system
- 7) For a closed system, the difference between the heat added to the system and work done by the gas, is equal to the change in _____.
a) enthalpy b) Entropy
c) internal energy d) Temperature
- 8) Heat-pump is used _____.
a) to heat space b) to cool the space
c) to convert heat into work d) None

- 9) Universal gas constant of perfect gas _____.
a) increases with temperature
b) decreases with temperature
c) increases with increase in molecular weight
d) is always constant
- 10) The internal energy of an ideal gas depends only on _____.
a) pressure
b) Volume
c) temperature
d) none of the above
- 11) Impeller is used in _____.
a) centrifugal pump
b) Engine
c) turbine
d) none of the above
- 12) Following is the impulse type water turbine _____.
a) Pelton turbine
b) Francis turbine
c) Kaplan turbine
d) None
- 13) The penstock is used _____.
a) to increase pressure energy of water leaving to tailrace
b) to decrease pressure energy of water leaving to tailrace
c) to convey water from dam to turbine
d) None
- 14) A condenser in a thermal power plant condenses steam coming out of _____.
a) Boiler
b) Super-heater
c) Economizer
d) Turbine

Seat No.	
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F.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019
BASIC MECHANICAL ENGINEERING

Day & Date: Friday, 13-12-2019

Max. Marks: 56

Time: 10:00 AM To 01:00 PM

- Instructions:** 1) Q.No.2 and Q.No.4 are short answer type question.
 2) Q.No.3 and Q.No.5 long answer type question.
 3) Neat diagram must be drawn whenever necessary.
 4) Make suitable assumptions, if necessary and mention them clearly.
 5) Use of log tables and non-programmable single memory calculator is allowed.

Section – I

Q.2 Answer any five of the following **15**

- a) State different statements of second law of thermodynamics.
- b) Compare BWR and PWR.
- c) Explain in brief point function and path function with suitable examples.
- d) Explain working of roots blower with neat sketch.
- e) Explain in brief working of double acting reciprocating pump.
- f) Explain the working of Vapour compression refrigeration cycle.
- g) Derive an expression for work done in adiabatic process.

Q.3 a) is compulsory. solve any two out of b) to e). **13**

- a) Steam enters a steam turbine with a velocity of 60 m/s and enthalpy of 2600 kJ/kg and leaves with a velocity of 100 m/s and enthalpy of 2150 kJ/kg. Heat lost from turbine to surrounding is 220kJ/min. Find power developed by turbine if steam flow rate is 5800 kg/hr. **05**
- b) A certain quantity of air has volume 0.028m^3 at pressure of 1.25 bar and 25°C . It is compressed to volume of 0.0042m^3 according to law $PV^{1.3}=\text{Constant}$. Find final temperature and work done during compression. Also determine reduction in pressure at constant volume required to bring system to its original temperature. **04**
- c) A system undergoes a cycle consist of 4 processes. The heat and work transfer are tabulated below. Prove that the table is consistent with first law of thermodynamics. Determine network and find thermal efficiency. **04**

Process	Q(kJ)	W(kJ)
1-2	1770	565
2-3	-1650	0
3-4	-900	-305
4-1	1040	0

- d) Explain with neat sketch, construction and working of Pelton turbine. **04**
- e) Draw a neat sketch of steam power plant. Explain function of air-pre heater, economizer and super heater. **04**

Section – II

- Q.4 Answer any five of the following.** **15**
- a)** Show in the figure following terms associated with an I.C. engine.
- 1) Bore
 - 2) Stroke
 - 3) Top dead center (T.D.C.)
 - 4) Bottom dead center (B.D.C.)
 - 5) Clearance volume
 - 6) Swept volume
- b)** An air standard diesel cycle has a compression ratio of 16 and the heat transferred to the working fluid per cycle is 2000 KJ/kg. At the beginning of compression stroke the pressure is 1 bar and the temperature is 27°C. Calculate.-
Thermal efficiency
- c)** What are the different modes of transmission of mechanical power?
- d)** What is gear? Explain Worm and Worm wheel gear with neat sketch.
- e)** Explain the different modes of failure of mechanical components.
- f)** Write note on selection of material for engineering application.
- g)** Compress Electric arc welding with gas welding.
- Q.5 a) is compulsory and solve any two out of b) to d).** **13**
- a)** An engine working on Otto cycle has a compression ratio of 8. **05**
Compression begins at 100 KPa and 15°C. The heat supplied per cycle is 2000 KJ/kg of air. Determine.
- 1) Thermal efficiency
 - 2) Maximum Cycle temperature.
- b)** Draw block diagram of lathe machine. Explain turning operation in brief. **04**
- c)** In open belt drive, two pulleys of 500 mm diameter are connected at **04**
distance of 2 m apart. The initial tension in the belt is 500 N if the coefficient of friction between the belt and pulley is 0.25. Find the power transmitted at 700 rpm. Also calculate the length of belt.
- d)** Explain aesthetic consideration in design of mechanical component. **04**

Seat
No.

**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS - II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) If the differential equation $(x^4 e^x - mxy^2)dx + 4x^2 y dy = 0$ is exact then the value of $m =$ _____.
 - a) 1
 - b) -4
 - c) -1
 - d) -2
- 2) If $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$ then Picard's first approximation is $y_1 =$ _____.
 - a) $1 + x + \frac{x^3}{3}$
 - b) $x + \frac{x^3}{3}$
 - c) $1 + x - \frac{x^3}{3}$
 - d) None
- 3) $\int_0^{\frac{\pi}{2}} \int_0^1 r \sin \theta d\theta dr =$ _____.
 - a) $\frac{1}{4}$
 - b) $\frac{1}{r}$
 - c) $\frac{1}{6}$
 - d) $\frac{1}{2}$
- 4) The volume obtained by revolving the area bounded by one arc of the curve $y = \sin x$ about, the x-axis is _____.
 - a) π^2
 - b) $\frac{\pi^2}{2}$
 - c) $\frac{\pi^2}{3}$
 - d) $\frac{\pi^2}{4}$
- 5) Divided difference formula is used when data are _____.
 - a) equally spaced
 - b) not equally spaced
 - c) Heterogeneous
 - d) none of these
- 6) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 3$ is _____.
 - a) 5
 - b) $2\sqrt{3}$
 - c) $\sqrt{5}$
 - d) $3\sqrt{2}$
- 7) In the integral $\int_0^1 \int_0^y \int_0^{x^2 y} f(x, y, z) dx dy dz$ integration is taken _____.
 - a) first w.r.t. z then w.r.t. y then w.r.t. x
 - b) first w.r.t. z then w.r.t. x then w.r.t. y
 - c) first w.r.t. x then w.r.t. y then w.r.t. z
 - d) first w.r.t. y then w.r.t. z then w.r.t. x

Seat No.	
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Set **P**

**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q. No. 2 is compulsory. Solve any two questions from Q. No. 3 & 5 in Section I.
2) Q. No. 7 is compulsory. Solve any two questions from Q. No. 6, 8, 9 in section II
3) Figures to the right indicate full marks.
4) Use of calculators is allowed.

- Q.2 a)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 4$ from the following table: **04**

X	0	1	2	3	4
y	7	17	45	103	203

- b)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.76$ from the following table: **05**

x	1.76	1.78	1.80	1.82	1.84	1.86
y	0.9822	0.9782	0.9738	0.9691	0.9604	0.9585

- Q.3 a)** Solve $y(xy + e^x)dx - e^x dy = 0$ **03**

- b)** Solve $\frac{dy}{dx} + y = x^2 y^6$ **03**

- c)** Solve $(2x - 6y - 3)dx - (x - 3y + 6)dy = 0$ **03**

- Q.4 a)** Find the curve in which the subnormal varies as the square of the radius vector **03**

- b)** Find the orthogonal trajectory of family of cardioid $r = a(1 + \cos \theta)$ **03**

- c)** When a switch is closed, the current built up in an electric circuit is given by $L \frac{di}{dt} + Ri = E$ if $L = 640, R = 250, E = 500$, and $i = 0$ when $t = 0$.
Show the current will approach 2 amp. When $t \rightarrow \infty$ **04**

- Q.5 Attempt any two.**

- a) i)** Use Picard's method solve $\frac{dy}{dx} = 1 + y^2$, given $y(0) = 0$ up to third approximations. Hence find the value y at $x=0.2$ **06**

- ii) Solve Using Taylor's method $\frac{dy}{dx} - x = y, y(0) = 1$ Hence find y at $x = 0.2$

- iii) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ at $x = 0.2$ in two steps using modified Euler's method

- b)** Use Runge-Kutta method to an approximate value of y at $x = 0.2$ given that with $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Take $h = 0.2$ **03**

Section - II

- Q.6 a)** Evaluate $\int_0^2 x^4(8 - x^3)^{-\frac{1}{3}} dx$ **03**

- b)** Evaluate $\int_0^\infty \frac{x^5}{5^x} dx$ **03**

- c)** Evaluate $\int_0^1 (x^\alpha - 1)(\log x)^{-1} dx, \alpha \geq 0$ **03**

- Q.7**
- a) Change the order of integration and evaluate $\int_0^\infty \int_0^x e^{\frac{-x^2}{y}} x \, dx dy$. **04**
- b) Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} dy dx dz$ **03**
- c) Evaluate by changing to polar co-ordinates **03**
 $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sin \left[\frac{\pi}{a^2} (a^2 - x^2 - y^2) \right] dx dy$.
- Q.8**
- a) Find by double integration the area between the curve $y^2 = 4ax$ and $x^2 = 4ay$. **03**
- b) In a lamina in the form of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ density at any point varies as product of its distance from axis of ellipse Find the mass. **03**
- c) The curve $r = a(1 + \cos \theta)$ revolves about the initial line find volume generated. **03**
- Q.9**
- a) Trace any two of following curves with full justification. **06**
- i) $r = a \cos 3\theta$
- ii) $x = t + \sin t, y = 1 - \cos t$
- iii) $xy^2 = a^2(a - x)$
- b) Find the length of the the cardioid $r = a(1 - \cos \theta)$ lying inside the circle $r = a \cos \theta$. **03**

Seat
No.F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – IIDay & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) The Orthogonal trajectories of the family of curves $xy = a$ is _____.
a) $x^2 - y^2 = c$ b) $x^2 + y^2 = c$
c) $x = cy$ d) $y^2 = 4cx$
- 2) The solution of the differential equation $x dx + y dy = 0$ is _____.
a) $xy = c$ b) $x + y = c$
c) $x^2y^2 = c$ d) $x^2 + y^2 = c$
- 3) The value of $\int_0^{\infty} e^{-x^4} dx$ is _____.
a) $\frac{1}{2} \left| \frac{1}{3} \right|$ b) $\frac{1}{4} \left| \frac{1}{4} \right|$
c) $\frac{1}{4} \left| \frac{1}{3} \right|$ d) $\frac{1}{3} \left| \frac{1}{4} \right|$
- 4) $\int_0^1 \int_0^1 dx dy$
a) $\frac{1}{2}$ b) $\frac{1}{4}$
c) 1 d) $\frac{3}{2}$
- 5) If the density ρ at any point varies as the distance of the point from y axis then $\rho =$ _____.
a) K.x b) K.xy
c) K.y d) K(x+y)
- 6) A double point is called a node if the two tangents there at are _____.
a) Coincident b) Imaginary
c) real and distinct d) none of these
- 7) For the fourth order Runge-Kutta method which of the following is correct ?
a) $K_1 = \frac{h}{2} f(x_0, y_0)$ b) $K_2 = hf(x_0 + h, y_0 + k)$
c) $K_3 = hf(x_0 + h, y_0 + k_2)$ d) $K_4 = hf(x_0 + h, y_0 + k_3)$
- 8) If the differential equation $(x^4e^x - mxy^2)dx + 4x^2ydy = 0$ is exact then the value of $m =$ _____.
a) 1 b) -4
c) -1 d) -2

- 9) If $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$ then Picard's first approximation is $y_1 = \underline{\hspace{2cm}}$.
- a) $1 + x + \frac{x^3}{3}$ b) $x + \frac{x^3}{3}$
 c) $1 + x - \frac{x^3}{3}$ d) None
- 10) $\int_0^{\frac{\pi}{2}} \int_0^1 r \sin \theta d\theta dr = \underline{\hspace{2cm}}$.
- a) $\frac{1}{4}$ b) $\frac{1}{2}$
 c) $\frac{1}{6}$ d) $\frac{1}{2}$
- 11) The volume obtained by revolving the area bounded by one arc of the curve $y = \sin x$ about, the x-axis is $\underline{\hspace{2cm}}$.
- a) π^2 b) $\frac{\pi^2}{2}$
 c) $\frac{\pi^2}{3}$ d) $\frac{\pi^2}{4}$
- 12) Divided difference formula is used when data are $\underline{\hspace{2cm}}$.
- a) equally spaced b) not equally spaced
 c) Heterogeneous d) none of these
- 13) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 3$ is $\underline{\hspace{2cm}}$.
- a) 5 b) $2\sqrt{3}$
 c) $\sqrt{5}$ d) $3\sqrt{2}$
- 14) In the integral $\int_0^1 \int_0^y \int_0^{x^2 y} f(x, y, z) dx dy dz$ integration is taken $\underline{\hspace{2cm}}$.
- a) first w.r.t. z then w.r.t. y then w.r.t. x
 b) first w.r.t. z then w.r.t. x then w.r.t. y
 c) first w.r.t.x then w.r.t. y then w.r.t. z
 d) first w.r.t. y then w.r.t. z then w.r.t. x

Seat No.	
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Set **Q**

**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q. No. 2 is compulsory. Solve any two questions from Q. No. 3 & 5 in Section I.
2) Q. No. 7 is compulsory. Solve any two questions from Q. No. 6, 8, 9 in section II
3) Figures to the right indicate full marks.
4) Use of calculators is allowed.

- Q.2 a)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 4$ from the following table: **04**

X	0	1	2	3	4
y	7	17	45	103	203

- b)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.76$ from the following table: **05**

x	1.76	1.78	1.80	1.82	1.84	1.86
y	0.9822	0.9782	0.9738	0.9691	0.9604	0.9585

- Q.3 a)** Solve $y(xy + e^x)dx - e^x dy = 0$ **03**
b) Solve $\frac{dy}{dx} + y = x^2 y^6$ **03**
c) Solve $(2x - 6y - 3)dx - (x - 3y + 6)dy = 0$ **03**

- Q.4 a)** Find the curve in which the subnormal varies as the square of the radius vector **03**
b) Find the orthogonal trajectory of family of cardioid $r = a(1 + \cos \theta)$ **03**
c) When a switch is closed, the current built up in an electric circuit is given by **04**
 $L \frac{di}{dt} + Ri = E$ if $L = 640, R = 250, E = 500$, and $i = 0$ when $t = 0$.
 Show the current will approach 2 amp. When $t \rightarrow \infty$

Q.5 Attempt any two.

- a) i)** Use Picard's method solve $\frac{dy}{dx} = 1 + y^2$, given $y(0) = 0$ up to third approximations. Hence find the value y at $x=0.2$ **06**
ii) Solve Using Taylor's method $\frac{dy}{dx} - x = y, y(0) = 1$ Hence find y at $x = 0.2$
iii) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ at $x = 0.2$ in two steps using modified Euler's method
b) Use Runge-Kutta method to an approximate value of y at $x = 0.2$ given that **03**
 with $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Take $h = 0.2$

Section – II

- Q.6 a)** Evaluate $\int_0^2 x^4(8 - x^3)^{-\frac{1}{3}} dx$ **03**
b) Evaluate $\int_0^\infty \frac{x^5}{5^x} dx$ **03**
c) Evaluate $\int_0^1 (x^\alpha - 1)(\log x)^{-1} dx, \alpha \geq 0$ **03**

- Q.7**
- a) Change the order of integration and evaluate $\int_0^\infty \int_0^x e^{\frac{-x^2}{y}} x \, dx dy.$ **04**
- b) Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} dy dx dz$ **03**
- c) Evaluate by changing to polar co-ordinates **03**
 $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sin \left[\frac{\pi}{a^2} (a^2 - x^2 - y^2) \right] dx dy.$
- Q.8**
- a) Find by double integration the area between the curve $y^2 = 4ax$ and $x^2 = 4ay.$ **03**
- b) In a lamina in the form of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ density at any point varies as product of its distance from axis of ellipse Find the mass. **03**
- c) The curve $r = a(1 + \cos \theta)$ revolves about the initial line find volume generated. **03**
- Q.9**
- a) Trace any two of following curves with full justification. **06**
 i) $r = a \cos 3\theta$
 ii) $x = t + \sin t, y = 1 - \cos t$
 iii) $xy^2 = a^2(a - x)$
- b) Find the length of the the cardioid $r = a(1 - \cos \theta)$ lying inside the circle $r = a \cos \theta.$ **03**

Seat
No.

**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. **14**

- 1) Divided difference formula is used when data are _____.
 - a) equally spaced
 - b) not equally spaced
 - c) Heterogeneous
 - d) none of these
- 2) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 3$ is _____.
 - a) 5
 - b) $2\sqrt{3}$
 - c) $\sqrt{5}$
 - d) $3\sqrt{2}$
- 3) In the integral $\int_0^1 \int_0^y \int_0^{x^2y} f(x, y, z) dx dy dz$ integration is taken _____.
 - a) first w.r.t. z then w.r.t. y then w.r.t. x
 - b) first w.r.t. z then w.r.t. x then w.r.t. y
 - c) first w.r.t. x then w.r.t. y then w.r.t. z
 - d) first w.r.t. y then w.r.t. z then w.r.t. x
- 4) The Orthogonal trajectories of the family of curves $xy = a$ is _____.
 - a) $x^2 - y^2 = c$
 - b) $x^2 + y^2 = c$
 - c) $x = cy$
 - d) $y^2 = 4cx$
- 5) The solution of the differential equation $x dx + y dy = 0$ is _____.
 - a) $xy = c$
 - b) $x + y = c$
 - c) $x^2y^2 = c$
 - d) $x^2 + y^2 = c$
- 6) The value of $\int_0^\infty e^{-x^4} dx$ is _____.
 - a) $\frac{1}{2} \left[\frac{1}{3} \right]$
 - b) $\frac{1}{4} \left[\frac{1}{4} \right]$
 - c) $\frac{1}{4} \left[\frac{1}{3} \right]$
 - d) $\frac{1}{3} \left[\frac{1}{4} \right]$
- 7) $\int_0^1 \int_0^1 dx dy$
 - a) $\frac{1}{2}$
 - b) $\frac{1}{4}$
 - c) 1
 - d) $\frac{3}{2}$
- 8) If the density ρ at any point varies as the distance of the point from y axis then $\rho =$ _____.
 - a) $K \cdot x$
 - b) $K \cdot xy$
 - c) $K \cdot y$
 - d) $K(x+y)$

- 9) A double point is called a node if the two tangents there at are _____.
a) Coincident b) Imaginary
c) real and distinct d) none of these
- 10) For the fourth order Runge-Kutta method which of the following is correct ?
a) $K_1 = \frac{h}{2} f(x_0, y_0)$ b) $K_2 = hf(x_0 + h, y_0 + k)$
c) $K_3 = hf(x_0 + h, y_0 + k_2)$ d) $K_4 = hf(x_0 + h, y_0 + k_3)$
- 11) If the differential equation $(x^4 e^x - mxy^2)dx + 4x^2 y dy = 0$ is exact then the value of $m =$ _____.
a) 1 b) -4
c) -1 d) -2
- 12) If $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$ then Picard's first approximation is $y_1 =$ _____.
a) $1 + x + \frac{x^3}{3}$ b) $x + \frac{x^3}{3}$
c) $1 + x - \frac{x^3}{3}$ d) None
- 13) $\int_0^{\frac{\pi}{2}} \int_0^1 r \sin \theta d\theta dr =$ _____.
a) $\frac{1}{4}$ b) $\frac{1}{r}$
c) $\frac{1}{6}$ d) $\frac{1}{2}$
- 14) The volume obtained by revolving the area bounded by one arc of the curve $y = \sin x$ about, the x-axis is _____.
a) π^2 b) $\frac{\pi^2}{2}$
c) $\frac{\pi^2}{3}$ d) $\frac{\pi^2}{4}$

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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q. No. 2 is compulsory. Solve any two questions from Q. No. 3 & 5 in Section I.
2) Q. No. 7 is compulsory. Solve any two questions from Q. No. 6, 8, 9 in section II
3) Figures to the right indicate full marks.
4) Use of calculators is allowed.

- Q.2 a)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 4$ from the following table: **04**

X	0	1	2	3	4
y	7	17	45	103	203

- b)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.76$ from the following table: **05**

x	1.76	1.78	1.80	1.82	1.84	1.86
y	0.9822	0.9782	0.9738	0.9691	0.9604	0.9585

- Q.3 a)** Solve $y(xy + e^x)dx - e^x dy = 0$ **03**
b) Solve $\frac{dy}{dx} + y = x^2 y^6$ **03**
c) Solve $(2x - 6y - 3)dx - (x - 3y + 6)dy = 0$ **03**

- Q.4 a)** Find the curve in which the subnormal varies as the square of the radius vector **03**
b) Find the orthogonal trajectory of family of cardioid $r = a(1 + \cos \theta)$ **03**
c) When a switch is closed, the current built up in an electric circuit is given by **04**
 $L \frac{di}{dt} + Ri = E$ if $L = 640, R = 250, E = 500$, and $i = 0$ when $t = 0$.
Show the current will approach 2 amp. When $t \rightarrow \infty$

Q.5 Attempt any two.

- a) i)** Use Picard's method solve $\frac{dy}{dx} = 1 + y^2$, given $y(0) = 0$ up to third approximations. Hence find the value y at $x=0.2$ **06**
ii) Solve Using Taylor's method $\frac{dy}{dx} - x = y, y(0) = 1$ Hence find y at $x = 0.2$
iii) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ at $x = 0.2$ in two steps using modified Euler's method
b) Use Runge-Kutta method to an approximate value of y at $x = 0.2$ given that **03**
with $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Take $h = 0.2$

Section - II

- Q.6 a)** Evaluate $\int_0^2 x^4(8 - x^3)^{-\frac{1}{3}} dx$ **03**
b) Evaluate $\int_0^\infty \frac{x^5}{5^x} dx$ **03**
c) Evaluate $\int_0^1 (x^\alpha - 1)(\log x)^{-1} dx, \alpha \geq 0$ **03**

- Q.7**
- a) Change the order of integration and evaluate $\int_0^\infty \int_0^x e^{\frac{-x^2}{y}} x \, dx dy$. **04**
- b) Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} dy dx dz$ **03**
- c) Evaluate by changing to polar co-ordinates **03**
 $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sin \left[\frac{\pi}{a^2} (a^2 - x^2 - y^2) \right] dx dy$.
- Q.8**
- a) Find by double integration the area between the curve $y^2 = 4ax$ and $x^2 = 4ay$. **03**
- b) In a lamina in the form of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ density at any point varies as product of its distance from axis of ellipse Find the mass. **03**
- c) The curve $r = a(1 + \cos \theta)$ revolves about the initial line find volume generated. **03**
- Q.9**
- a) Trace any two of following curves with full justification. **06**
- i) $r = a \cos 3\theta$
- ii) $x = t + \sin t, y = 1 - \cos t$
- iii) $xy^2 = a^2(a - x)$
- b) Find the length of the the cardioid $r = a(1 - \cos \theta)$ lying inside the circle $r = a \cos \theta$. **03**

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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence.

14

- 1) The value of $\int_0^{\infty} e^{-x^4} dx$ is _____.
 - a) $\frac{1}{2} \left[\frac{1}{3} \right]$
 - b) $\frac{1}{4} \left[\frac{1}{4} \right]$
 - c) $\frac{1}{4} \left[\frac{1}{3} \right]$
 - d) $\frac{1}{3} \left[\frac{1}{4} \right]$
- 2) $\int_0^1 \int_0^1 dx dy$
 - a) $\frac{1}{2}$
 - b) $\frac{1}{4}$
 - c) 1
 - d) $\frac{3}{2}$
- 3) If the density ρ at any point varies as the distance of the point from y axis then $\rho =$ _____.
 - a) K.x
 - b) K.xy
 - c) K.y
 - d) K(x+y)
- 4) A double point is called a node if the two tangents there are _____.
 - a) Coincident
 - b) Imaginary
 - c) real and distinct
 - d) none of these
- 5) For the fourth order Runge-Kutta method which of the following is correct ?
 - a) $K_1 = \frac{h}{2} f(x_0, y_0)$
 - b) $K_2 = hf(x_0 + h, y_0 + k)$
 - c) $K_3 = hf(x_0 + h, y_0 + k_2)$
 - d) $K_4 = hf(x_0 + h, y_0 + k_3)$
- 6) If the differential equation $(x^4 e^x - mxy^2)dx + 4x^2 y dy = 0$ is exact then the value of m = _____.
 - a) 1
 - b) -4
 - c) -1
 - d) -2
- 7) If $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$ then Picard's first approximation is $y_1 =$ _____.
 - a) $1 + x + \frac{x^3}{3}$
 - b) $x + \frac{x^3}{3}$
 - c) $1 + x - \frac{x^3}{3}$
 - d) None

Seat No.	
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Set **S**

**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING MATHEMATICS – II**

Day & Date: Friday, 22-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Q. No. 2 is compulsory. Solve any two questions from Q. No. 3 & 5 in Section I.
2) Q. No. 7 is compulsory. Solve any two questions from Q. No. 6, 8, 9 in section II
3) Figures to the right indicate full marks.
4) Use of calculators is allowed.

- Q.2 a)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 4$ from the following table: **04**

X	0	1	2	3	4
y	7	17	45	103	203

- b)** Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.76$ from the following table: **05**

x	1.76	1.78	1.80	1.82	1.84	1.86
y	0.9822	0.9782	0.9738	0.9691	0.9604	0.9585

- Q.3 a)** Solve $y(xy + e^x)dx - e^x dy = 0$ **03**

- b)** Solve $\frac{dy}{dx} + y = x^2 y^6$ **03**

- c)** Solve $(2x - 6y - 3)dx - (x - 3y + 6)dy = 0$ **03**

- Q.4 a)** Find the curve in which the subnormal varies as the square of the radius vector **03**

- b)** Find the orthogonal trajectory of family of cardioid $r = a(1 + \cos \theta)$ **03**

- c)** When a switch is closed, the current built up in an electric circuit is given by $L \frac{di}{dt} + Ri = E$ if $L = 640, R = 250, E = 500$, and $i = 0$ when $t = 0$. **04**

Show the current will approach 2 amp. When $t \rightarrow \infty$

- Q.5 Attempt any two.**

- a) i)** Use Picard's method solve $\frac{dy}{dx} = 1 + y^2$, given $y(0) = 0$ up to third approximations. Hence find the value y at $x=0.2$ **06**

- ii)** Solve Using Taylor's method $\frac{dy}{dx} - x = y, y(0) = 1$ Hence find y at $x = 0.2$

- iii)** Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ at $x = 0.2$ in two steps using modified Euler's method

- b)** Use Runge-Kutta method to an approximate value of y at $x = 0.2$ given that $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Take $h = 0.2$ **03**

Section - II

- Q.6 a)** Evaluate $\int_0^2 x^4(8 - x^3)^{-\frac{1}{3}} dx$ **03**

- b)** Evaluate $\int_0^\infty \frac{x^5}{5^x} dx$ **03**

- c)** Evaluate $\int_0^1 (x^\alpha - 1)(\log x)^{-1} dx, \alpha \geq 0$ **03**

- Q.7**
- a) Change the order of integration and evaluate $\int_0^\infty \int_0^x e^{\frac{-x^2}{y}} x \, dx dy.$ **04**
 - b) Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} dy dx dz$ **03**
 - c) Evaluate by changing to polar co-ordinates $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sin \left[\frac{\pi}{a^2} (a^2 - x^2 - y^2) \right] dx dy.$ **03**
- Q.8**
- a) Find by double integration the area between the curve $y^2 = 4ax$ and $x^2 = 4ay.$ **03**
 - b) In a lamina in the form of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ density at any point varies as product of its distance from axis of ellipse Find the mass. **03**
 - c) The curve $r = a(1 + \cos \theta)$ revolves about the initial line find volume generated. **03**
- Q.9**
- a) Trace any two of following curves with full justification. **06**
 - i) $r = a \cos 3\theta$
 - ii) $x = t + \sin t, y = 1 - \cos t$
 - iii) $xy^2 = a^2(a - x)$
 - b) Find the length of the the cardioid $r = a(1 - \cos \theta)$ lying inside the circle $r = a \cos \theta.$ **03**

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F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:**
- 1) Q. No. 1 is compulsory it should be solved in first 30 minutes in answer Book.
 - 2) Assume suitable data, if necessary and mention it clearly.
 - 3) Use of non-programmable calculator is allowed.
 - 4) Marks to the right hand indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence.

14

- 1) Quadrantal bearing can be reckoned from _____.
 a) East line b) North line
 c) Either from north or south d) West line
- 2) Principle of surveying 'working from whole to part' prevents _____.
 a) Linear error b) Angular error
 c) Accumulation of errors d) Chaining
- 3) Sprinkler irrigation is adopted for _____ areas.
 a) Level b) Uneven
 c) Hilly d) Desert
- 4) The highest point of road surface is called _____.
 a) Crown b) Camber
 c) Gradient d) Berm
- 5) Which of the following reference direction is used in a geodetic surveying?
 a) True b) Magnetic
 c) Arbitrary d) None of these
- 6) If back bearing of line is 105° , its Fore Bearing is _____.
 a) 345° b) 5°
 c) 285° d) 355°
- 7) Which of the following is not sub-branch of civil Engineering?
 a) Fluid mechanics b) Structural engineering
 c) Environmental engineering d) Thermal engineering
- 8) Concrete is weak in _____.
 a) Tension b) Strain
 c) Compression d) Stress
- 9) Process of covering rough wall surfaces with mortar to obtain even, smooth, and durable surface is called as _____.
 a) Pointing b) Plastering
 c) Curing d) Racking

- 10) This is not a type of deep foundation _____.
a) Wall footing
b) Pier Foundation
c) Pile Foundation
d) Well Foundation
- 11) Final setting time of ordinary Portland cement is _____.
a) 60 min
b) 30 min
c) 300 min
d) 600 min
- 12) The Minimum area requirement for habitable room is _____.
a) 9.5 m²
b) 8.5 m²
c) 10.5 m²
d) 11.5 m²
- 13) Kitchen should have _____ aspect.
a) Eastern
b) Western
c) Southern
d) Northern
- 14) Earthquake proof construction is built by using _____.
a) quality materials
b) good construction methods
c) I.S.codes
d) all of these

Seat No.	
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Set **P**

F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Question No.2 is compulsory in section-I. solve any two question from Q. No. 3 to Q. No.5.
2) Question No.6 is compulsory in section-II. solve any two question from Q. No. 7 to Q. No.9.
3) Figures to the right indicate full marks.

Section – I

- Q.2** a) Explain briefly relevance of Civil engineering to Allied fields. **03**
b) State the principles of surveying and explain any one. **03**
c) A 20 m chain was found after chaining 1500 m, to be 10 cm too long. The same chain at the end of the work after chaining total length of 2900 m was found to be 18 cm too long. What is the total distance chained if the chain was correct at the commencement of the work? **04**

- Q.3** a) What do you mean by local attraction? **02**
b) Following bearings were observed while running a closed traverse PQRSP **07**
1) Find out included angles.
2) Find out corrected bearings.

Line	F.B.	B.B
PQ	124°30'	304°30'
QR	68°15'	246°00'
RS	310° 30'	135°15'
SP	200°15'	17°45'

- Q.4** a) What are the methods of irrigation? Describe one of it. **03**
b) Explain road section in cutting with neat sketches. **03**
c) Enlist different types of Bench Marks and write their suitability. **03**
- Q.5** a) Define Contour and write any two characteristics of contours. **02**
b) The following consecutive readings were taken with a level and 5.0 m leveling staff at a common interval of 20.0 m. **07**
0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110, 4.485.
The reduced level of the first pt. was 208.125.
Enter the readings in a tabular form and reduce the level by Rise and fall method. Apply usual arithmetic checks. Show specimen calculations.
Calculate gradient of the line joining 1st and last station.

Section – II

- Q.6** a) Differentiate between: **06**
1) Load bearing structure and Framed structure
2) Shallow and deep foundation
b) What are the criterion for earthquake resistant design of structures? **04**

- Q.7** a) Certain plot has dimensions as 50 x 30 m. where F.S.I. of 1.5 is permissible. 50 m side of the plot is facing a road. If a G+1 structure is to be built on this plot, how much area can be built on ground floor and first floor if margins on front and back side is 3 m and on sides 2 m. **06**
- b) Discuss in brief any one of the following planning principles. **03**
- 1) Aspect
 - 2) Prospect
- Q.8** a) Explain water-cement ratio and its effect on the strength of concrete. **04**
- b) Give types of concrete. Discuss the suitability of each. **05**
- Q.9** a) Write a short note on GPS and its application in various fields. **05**
- b) Write a short note on Energy Efficient Building. **04**

Seat No.	
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Set	Q
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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory it should be solved in first 30 minutes in answer Book.
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MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Concrete is weak in _____.

a) Tension	b) Strain
c) Compression	d) Stress

- 2) Process of covering rough wall surfaces with mortar to obtain even, smooth, and durable surface is called as _____.

a) Pointing	b) Plastering
c) Curing	d) Racking

- 3) This is not a type of deep foundation _____.

a) Wall footing	b) Pier Foundation
c) Pile Foundation	d) Well Foundation

- 4) Final setting time of ordinary Portland cement is _____.

a) 60 min	b) 30 min
c) 300 min	d) 600 min

- 5) The Minimum area requirement for habitable room is _____.

a) 9.5 m ²	b) 8.5 m ²
c) 10.5 m ²	d) 11.5 m ²

- 6) Kitchen should have _____ aspect.

a) Eastern	b) Western
c) Southern	d) Northern

- 7) Earthquake proof construction is built by using _____.

a) quality materials	b) good construction methods
c) I.S.codes	d) all of these

- 8) Quadrantal bearing can be reckoned from _____.

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- 10) Sprinkler irrigation is adopted for _____ areas.
- | | |
|----------|-----------|
| a) Level | b) Uneven |
| c) Hilly | d) Desert |
- 11) The highest point of road surface is called _____.
- | | |
|-------------|-----------|
| a) Crown | b) Camber |
| c) Gradient | d) Berm |
- 12) Which of the following reference direction is used in a geodetic surveying?
- | | |
|--------------|------------------|
| a) True | b) Magnetic |
| c) Arbitrary | d) None of these |
- 13) If back bearing of line is 105° , its Fore Bearing is _____.
- | | |
|----------------|----------------|
| a) 345° | b) 5° |
| c) 285° | d) 355° |
- 14) Which of the following is not sub-branch of civil Engineering?
- | | |
|------------------------------|---------------------------|
| a) Fluid mechanics | b) Structural engineering |
| c) Environmental engineering | d) Thermal engineering |

Seat No.	
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Set **Q**

**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Question No.2 is compulsory in section-I. solve any two question from Q. No. 3 to Q. No.5.
2) Question No.6 is compulsory in section-II. solve any two question from Q. No. 7 to Q. No.9.
3) Figures to the right indicate full marks.

Section – I

- Q.2** a) Explain briefly relevance of Civil engineering to Allied fields. **03**
b) State the principles of surveying and explain any one. **03**
c) A 20 m chain was found after chaining 1500 m, to be 10 cm too long. The same chain at the end of the work after chaining total length of 2900 m was found to be 18 cm too long. What is the total distance chained if the chain was correct at the commencement of the work? **04**

- Q.3** a) What do you mean by local attraction? **02**
b) Following bearings were observed while running a closed traverse PQRSP **07**
1) Find out included angles.
2) Find out corrected bearings.

Line	F.B.	B.B
PQ	124°30'	304°30'
QR	68°15'	246°00'
RS	310° 30'	135°15'
SP	200°15'	17°45'

- Q.4** a) What are the methods of irrigation? Describe one of it. **03**
b) Explain road section in cutting with neat sketches. **03**
c) Enlist different types of Bench Marks and write their suitability. **03**
- Q.5** a) Define Contour and write any two characteristics of contours. **02**
b) The following consecutive readings were taken with a level and 5.0 m leveling staff at a common interval of 20.0 m. **07**
0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110, 4.485.
The reduced level of the first pt. was 208.125.
Enter the readings in a tabular form and reduce the level by Rise and fall method. Apply usual arithmetic checks. Show specimen calculations.
Calculate gradient of the line joining 1st and last station.

Section – II

- Q.6** a) Differentiate between: **06**
1) Load bearing structure and Framed structure
2) Shallow and deep foundation
b) What are the criterion for earthquake resistant design of structures? **04**

- Q.7** a) Certain plot has dimensions as 50 x 30 m. where F.S.I. of 1.5 is permissible. 50 m side of the plot is facing a road. If a G+1 structure is to be built on this plot, how much area can be built on ground floor and first floor if margins on front and back side is 3 m and on sides 2 m. **06**
- b) Discuss in brief any one of the following planning principles. **03**
- 1) Aspect
 - 2) Prospect
- Q.8** a) Explain water-cement ratio and its effect on the strength of concrete. **04**
- b) Give types of concrete. Discuss the suitability of each. **05**
- Q.9** a) Write a short note on GPS and its application in various fields. **05**
- b) Write a short note on Energy Efficient Building. **04**

Seat No.	
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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory it should be solved in first 30 minutes in answer Book.
2) Assume suitable data, if necessary and mention it clearly.
3) Use of non-programmable calculator is allowed.
4) Marks to the right hand indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence.

14

- 1) Which of the following reference direction is used in a geodetic surveying?
 - a) True
 - b) Magnetic
 - c) Arbitrary
 - d) None of these
- 2) If back bearing of line is 105° , its Fore Bearing is _____.
 - a) 345°
 - b) 5°
 - c) 285°
 - d) 355°
- 3) Which of the following is not sub-branch of civil Engineering?
 - a) Fluid mechanics
 - b) Structural engineering
 - c) Environmental engineering
 - d) Thermal engineering
- 4) Concrete is weak in _____.
 - a) Tension
 - b) Strain
 - c) Compression
 - d) Stress
- 5) Process of covering rough wall surfaces with mortar to obtain even, smooth, and durable surface is called as _____.
 - a) Pointing
 - b) Plastering
 - c) Curing
 - d) Racking
- 6) This is not a type of deep foundation _____.
 - a) Wall footing
 - b) Pier Foundation
 - c) Pile Foundation
 - d) Well Foundation
- 7) Final setting time of ordinary Portland cement is _____.
 - a) 60 min
 - b) 30 min
 - c) 300 min
 - d) 600 min
- 8) The Minimum area requirement for habitable room is _____.
 - a) 9.5 m^2
 - b) 8.5 m^2
 - c) 10.5 m^2
 - d) 11.5 m^2
- 9) Kitchen should have _____ aspect.
 - a) Eastern
 - b) Western
 - c) Southern
 - d) Northern

- 10) Earthquake proof construction is built by using _____.
a) quality materials b) good construction methods
c) I.S.codes d) all of these
- 11) Quadrantal bearing can be reckoned from _____.
a) East line b) North line
c) Either from north or south d) West line
- 12) Principle of surveying 'working from whole to part' prevents _____.
a) Linear error b) Angular error
c) Accumulation of errors d) Chaining
- 13) Sprinkler irrigation is adopted for _____ areas.
a) Level b) Uneven
c) Hilly d) Desert
- 14) The highest point of road surface is called _____.
a) Crown b) Camber
c) Gradient d) Berm

Seat No.	
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Set **R**

F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Question No.2 is compulsory in section-I. solve any two question from Q. No. 3 to Q. No.5.
 2) Question No.6 is compulsory in section-II. solve any two question from Q. No. 7 to Q. No.9.
 3) Figures to the right indicate full marks.

Section – I

- Q.2** a) Explain briefly relevance of Civil engineering to Allied fields. **03**
 b) State the principles of surveying and explain any one. **03**
 c) A 20 m chain was found after chaining 1500 m, to be 10 cm too long. The same chain at the end of the work after chaining total length of 2900 m was found to be 18 cm too long. What is the total distance chained if the chain was correct at the commencement of the work? **04**

- Q.3** a) What do you mean by local attraction? **02**
 b) Following bearings were observed while running a closed traverse PQRSP **07**
 1) Find out included angles.
 2) Find out corrected bearings.

Line	F.B.	B.B
PQ	124°30'	304°30'
QR	68°15'	246°00'
RS	310° 30'	135°15'
SP	200°15'	17°45'

- Q.4** a) What are the methods of irrigation? Describe one of it. **03**
 b) Explain road section in cutting with neat sketches. **03**
 c) Enlist different types of Bench Marks and write their suitability. **03**
- Q.5** a) Define Contour and write any two characteristics of contours. **02**
 b) The following consecutive readings were taken with a level and 5.0 m leveling staff at a common interval of 20.0 m. **07**
 0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110, 4.485.
 The reduced level of the first pt. was 208.125.
 Enter the readings in a tabular form and reduce the level by Rise and fall method. Apply usual arithmetic checks. Show specimen calculations.
 Calculate gradient of the line joining 1st and last station.

Section – II

- Q.6** a) Differentiate between: **06**
 1) Load bearing structure and Framed structure
 2) Shallow and deep foundation
 b) What are the criterion for earthquake resistant design of structures? **04**

- | | | | |
|------------|-----------|---|-----------|
| Q.7 | a) | Certain plot has dimensions as 50 x 30 m. where F.S.I. of 1.5 is permissible. 50 m side of the plot is facing a road. If a G+1 structure is to be built on this plot, how much area can be built on ground floor and first floor if margins on front and back side is 3 m and on sides 2 m. | 06 |
| | b) | Discuss in brief any one of the following planning principles. | 03 |
| | | 1) Aspect | |
| | | 2) Prospect | |
| Q.8 | a) | Explain water-cement ratio and its effect on the strength of concrete. | 04 |
| | b) | Give types of concrete. Discuss the suitability of each. | 05 |
| Q.9 | a) | Write a short note on GPS and its application in various fields. | 05 |
| | b) | Write a short note on Energy Efficient Building. | 04 |

Seat No.	
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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING**

Day & Date: Saturday, 23-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory it should be solved in first 30 minutes in answer Book.
2) Assume suitable data, if necessary and mention it clearly.
3) Use of non-programmable calculator is allowed.
4) Marks to the right hand indicate full marks.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence.

14

- 1) This is not a type of deep foundation _____.

a) Wall footing	b) Pier Foundation
c) Pile Foundation	d) Well Foundation
- 2) Final setting time of ordinary Portland cement is _____.

a) 60 min	b) 30 min
c) 300 min	d) 600 min
- 3) The Minimum area requirement for habitable room is _____.

a) 9.5 m ²	b) 8.5 m ²
c) 10.5 m ²	d) 11.5 m ²
- 4) Kitchen should have _____ aspect.

a) Eastern	b) Western
c) Southern	d) Northern
- 5) Earthquake proof construction is built by using _____.

a) quality materials	b) good construction methods
c) I.S.codes	d) all of these
- 6) Quadrantal bearing can be reckoned from _____.

a) East line	b) North line
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- 7) Principle of surveying 'working from whole to part' prevents _____.

a) Linear error	b) Angular error
c) Accumulation of errors	d) Chaining
- 8) Sprinkler irrigation is adopted for _____ areas.

a) Level	b) Uneven
c) Hilly	d) Desert
- 9) The highest point of road surface is called _____.

a) Crown	b) Camber
c) Gradient	d) Berm

- 10) Which of the following reference direction is used in a geodetic surveying?
- a) True
 - b) Magnetic
 - c) Arbitrary
 - d) None of these
- 11) If back bearing of line is 105° , its Fore Bearing is _____.
- a) 345°
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 - c) 285°
 - d) 355°
- 12) Which of the following is not sub-branch of civil Engineering?
- a) Fluid mechanics
 - b) Structural engineering
 - c) Environmental engineering
 - d) Thermal engineering
- 13) Concrete is weak in _____.
- a) Tension
 - b) Strain
 - c) Compression
 - d) Stress
- 14) Process of covering rough wall surfaces with mortar to obtain even, smooth, and durable surface is called as _____.
- a) Pointing
 - b) Plastering
 - c) Curing
 - d) Racking

Seat No.	
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Set **S**

F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC CIVIL ENGINEERING

Day & Date: Saturday, 23-11-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) Question No.2 is compulsory in section-I. solve any two question from Q. No. 3 to Q. No.5.
 2) Question No.6 is compulsory in section-II. solve any two question from Q. No. 7 to Q. No.9.
 3) Figures to the right indicate full marks.

Section – I

- Q.2** a) Explain briefly relevance of Civil engineering to Allied fields. **03**
 b) State the principles of surveying and explain any one. **03**
 c) A 20 m chain was found after chaining 1500 m, to be 10 cm too long. The same chain at the end of the work after chaining total length of 2900 m was found to be 18 cm too long. What is the total distance chained if the chain was correct at the commencement of the work? **04**

- Q.3** a) What do you mean by local attraction? **02**
 b) Following bearings were observed while running a closed traverse PQRSP **07**
 1) Find out included angles.
 2) Find out corrected bearings.

Line	F.B.	B.B
PQ	124°30'	304°30'
QR	68°15'	246°00'
RS	310° 30'	135°15'
SP	200°15'	17°45'

- Q.4** a) What are the methods of irrigation? Describe one of it. **03**
 b) Explain road section in cutting with neat sketches. **03**
 c) Enlist different types of Bench Marks and write their suitability. **03**
- Q.5** a) Define Contour and write any two characteristics of contours. **02**
 b) The following consecutive readings were taken with a level and 5.0 m leveling staff at a common interval of 20.0 m. **07**
 0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110, 4.485.
 The reduced level of the first pt. was 208.125.
 Enter the readings in a tabular form and reduce the level by Rise and fall method. Apply usual arithmetic checks. Show specimen calculations.
 Calculate gradient of the line joining 1st and last station.

Section – II

- Q.6** a) Differentiate between: **06**
 1) Load bearing structure and Framed structure
 2) Shallow and deep foundation
 b) What are the criterion for earthquake resistant design of structures? **04**

- Q.7 a)** Certain plot has dimensions as 50 x 30 m. where F.S.I. of 1.5 is permissible. 50 m side of the plot is facing a road. If a G+1 structure is to be built on this plot, how much area can be built on ground floor and first floor if margins on front and back side is 3 m and on sides 2 m. **06**
- b)** Discuss in brief any one of the following planning principles. **03**
- 1) Aspect
 - 2) Prospect
- Q.8 a)** Explain water-cement ratio and its effect on the strength of concrete. **04**
- b)** Give types of concrete. Discuss the suitability of each. **05**
- Q.9 a)** Write a short note on GPS and its application in various fields. **05**
- b)** Write a short note on Energy Efficient Building. **04**

- 11) Which of the following function is more appropriate for reading in a multi-word string?
- | | |
|-------------|------------|
| a) printf() | b) scanf() |
| c) gets() | d) puts() |
- 12) Standard ANSI C recognizes _____ number of keywords?
- | | |
|-------|-------|
| a) 30 | b) 32 |
| c) 24 | d) 36 |
- 13) What is the size of a char data type in C?
- | | |
|------------|------------|
| a) 1 byte | b) 2 bytes |
| c) 3 bytes | d) 4 bytes |
- 14) If the two strings are identical, then strcmp() function returns _____.
- | | |
|-------|--------|
| a) -1 | b) 1 |
| c) 0 | d) YES |

Seat No.	
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F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING

Day & Date: Monday, 25-11-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) Draw neat labeled diagram whenever necessary.
 - 4) Use of only non programmable calculator is allowed.
 - 5) Assume suitable data wherever necessary.

Section – I

- Q.2 Solve any four questions. 16**
- a) What is need of filter? Explain capacitor filter.
 - b) Explain Zener as a voltage regulator.
 - c) Explain transistor as a switch with circuit diagram.
 - d) Explain types of strain gauges and also define gauge factor.
 - e) Explain following gates with symbol, equation and truth table.
 - 1) EX-NOR
 - 2) OR
 - 3) NAND
- Q.3 Solve any two questions. 12**
- a) Explain working principle of LVDT.
 - b) Explain CE configuration of transistor with I/P and O/P characteristics.
 - c) Perform following binary subtractions using 2's complement.
 - 1) $(BC)_{16} - (AD)_{16}$
 - 2) $(763)_8 - (457)_8$

Section – II

- Q.4 Attempt any four. 16**
- a) What is Algorithm? Explain with example.
 - b) What are the logical operators are used in C? Explain with example.
 - c) Define - Variable, Constant, Data Type and Array with example.
 - d) Write a C program to find largest number among user entered three numbers.
 - e) What is Pointer? Explain with example.
- Q.5 Attempt any two. 12**
- a) What is string? Explain any four string-handling functions in C library.
 - b) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1X2X3X4 = 24)
 - c) Write a program to calculate summation of five array element.

Seat No.	
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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
2) Draw neat labeled diagram whenever necessary.
3) Use of only non programmable calculator is allowed.
4) Assume suitable data wherever necessary.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Who developed the C Programming language?
 - a) Bjarne Stroustrup
 - b) James Gosling
 - c) Dennis Ritchie
 - d) Ray Boyce
- 2) Which of the following is the valid C variable name?
 - a) For
 - b) 1st
 - c) var name
 - d) Num1
- 3) & operator returns _____ of a variable.
 - a) name
 - b) memory address
 - c) value
 - d) none of the above
- 4) Which of the following function is more appropriate for reading in a multi-word string?
 - a) printf()
 - b) scanf()
 - c) gets()
 - d) puts()
- 5) Standard ANSI C recognizes _____ number of keywords?
 - a) 30
 - b) 32
 - c) 24
 - d) 36
- 6) What is the size of a char data type in C?
 - a) 1 byte
 - b) 2 bytes
 - c) 3 bytes
 - d) 4 bytes
- 7) If the two strings are identical, then strcmp() function returns _____.
 - a) -1
 - b) 1
 - c) 0
 - d) YES
- 8) Rectifier efficiency of a full wave rectifier is _____.
 - a) 40.6%
 - b) 48%
 - c) 78%
 - d) 81.2%
- 9) LVDT is a _____ transducer.
 - a) resistive
 - b) temperature
 - c) passive
 - d) active
- 10) $(1110)_2 - (1001)_2 =$ _____.
 - a) 1001
 - b) 0101
 - c) 0001
 - d) 1000

Seat No.	
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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) Draw neat labeled diagram whenever necessary.
 - 4) Use of only non programmable calculator is allowed.
 - 5) Assume suitable data wherever necessary.

Section – I

- Q.2 Solve any four questions. 16**
- a) What is need of filter? Explain capacitor filter.
 - b) Explain Zener as a voltage regulator.
 - c) Explain transistor as a switch with circuit diagram.
 - d) Explain types of strain gauges and also define gauge factor.
 - e) Explain following gates with symbol, equation and truth table.
 - 1) EX-NOR
 - 2) OR
 - 3) NAND
- Q.3 Solve any two questions. 12**
- a) Explain working principle of LVDT.
 - b) Explain CE configuration of transistor with I/P and O/P characteristics.
 - c) Perform following binary subtractions using 2's complement.
 - 1) $(BC)_{16} - (AD)_{16}$
 - 2) $(763)_8 - (457)_8$

Section – II

- Q.4 Attempt any four. 16**
- a) What is Algorithm? Explain with example.
 - b) What are the logical operators are used in C? Explain with example.
 - c) Define - Variable, Constant, Data Type and Array with example.
 - d) Write a C program to find largest number among user entered three numbers.
 - e) What is Pointer? Explain with example.
- Q.5 Attempt any two. 12**
- a) What is string? Explain any four string-handling functions in C library.
 - b) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1X2X3X4 = 24)
 - c) Write a program to calculate summation of five array element.

Seat No.	
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Set

R

F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- 2) Draw neat labeled diagram whenever necessary.
- 3) Use of only non programmable calculator is allowed.
- 4) Assume suitable data wherever necessary.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) 2's compliment of 1111 is _____.
 - a) 0101
 - b) 1000
 - c) 0001
 - d) none of these
- 2) γ is the symbol of current gain for configuration: _____.
 - a) CC
 - b) CE
 - c) CB
 - d) none of these
- 3) Value of β is always _____.
 - a) less than 1
 - b) greater than 1
 - c) equal to zero
 - d) none of these
- 4) Who developed the C Programming language?
 - a) Bjarne Stroustrup
 - b) James Gosling
 - c) Dennis Ritchie
 - d) Ray Boyce
- 5) Which of the following is the valid C variable name?
 - a) For
 - b) 1st
 - c) var name
 - d) Num1
- 6) & operator returns _____ of a variable.
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 - b) memory address
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 - d) none of the above
- 7) Which of the following function is more appropriate for reading in a multi-word string?
 - a) printf()
 - b) scanf()
 - c) gets()
 - d) puts()
- 8) Standard ANSI C recognizes _____ number of keywords?
 - a) 30
 - b) 32
 - c) 24
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- 9) What is the size of a char data type in C?
 - a) 1 byte
 - b) 2 bytes
 - c) 3 bytes
 - d) 4 bytes
- 10) If the two strings are identical, then strcmp() function returns _____.
 - a) -1
 - b) 1
 - c) 0
 - d) YES

- 11) Rectifier efficiency of a full wave rectifier is _____.
a) 40.6% b) 48%
c) 78% d) 81.2%
- 12) LVDT is a _____ transducer.
a) resistive b) temperature
c) passive d) active
- 13) $(1110)_2 - (1001)_2 = \text{_____}$.
a) 1001 b) 0101
c) 0001 d) 1000
- 14) The knee voltage for germanium diode is _____.
a) 0.3 V b) 0.6 V
c) 0.7 V d) 0.9 V

Seat No.	
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F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING

Day & Date: Monday, 25-11-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

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

Q.2 Solve any four questions. 16

- a) What is need of filter? Explain capacitor filter.
- b) Explain Zener as a voltage regulator.
- c) Explain transistor as a switch with circuit diagram.
- d) Explain types of strain gauges and also define gauge factor.
- e) Explain following gates with symbol, equation and truth table.
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 - 2) OR
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- a) Explain working principle of LVDT.
- b) Explain CE configuration of transistor with I/P and O/P characteristics.
- c) Perform following binary subtractions using 2's complement.
 - 1) $(BC)_{16} - (AD)_{16}$
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Section – II

Q.4 Attempt any four. 16

- a) What is Algorithm? Explain with example.
- b) What are the logical operators are used in C? Explain with example.
- c) Define - Variable, Constant, Data Type and Array with example.
- d) Write a C program to find largest number among user entered three numbers.
- e) What is Pointer? Explain with example.

Q.5 Attempt any two. 12

- a) What is string? Explain any four string-handling functions in C library.
- b) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1X2X3X4 = 24)
- c) Write a program to calculate summation of five array element.

Seat No.	
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**F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING**

Day & Date: Monday, 25-11-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.
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3) Use of only non programmable calculator is allowed.
4) Assume suitable data wherever necessary.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) & operator returns _____ of a variable.
 - a) name
 - b) memory address
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 - d) none of the above
- 2) Which of the following function is more appropriate for reading in a multi-word string?
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- 8) $(1110)_2 - (1001)_2 =$ _____.
 - a) 1001
 - b) 0101
 - c) 0001
 - d) 1000
- 9) The knee voltage for germanium diode is _____.
 - a) 0.3 V
 - b) 0.6 V
 - c) 0.7 V
 - d) 0.9 V
- 10) 2's compliment of 1111 is _____.
 - a) 0101
 - b) 1000
 - c) 0001
 - d) none of these

- 11) γ is the symbol of current gain for configuration: _____.
a) CC b) CE
c) CB d) none of these
- 12) Value of β is always _____.
a) less than 1 b) greater than 1
c) equal to zero d) none of these
- 13) Who developed the C Programming language?
a) Bjarne Stroustrup b) James Gosling
c) Dennis Ritchie d) Ray Boyce
- 14) Which of the following is the valid C variable name?
a) For b) 1st
c) var name d) Num1

Seat No.	
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F.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019
BASIC ELECTRONICS & COMPUTER PROGRAMMING

Day & Date: Monday, 25-11-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) Draw neat labeled diagram whenever necessary.
 - 4) Use of only non programmable calculator is allowed.
 - 5) Assume suitable data wherever necessary.

Section – I

Q.2 Solve any four questions. 16

- a) What is need of filter? Explain capacitor filter.
- b) Explain Zener as a voltage regulator.
- c) Explain transistor as a switch with circuit diagram.
- d) Explain types of strain gauges and also define gauge factor.
- e) Explain following gates with symbol, equation and truth table.
 - 1) EX-NOR
 - 2) OR
 - 3) NAND

Q.3 Solve any two questions. 12

- a) Explain working principle of LVDT.
- b) Explain CE configuration of transistor with I/P and O/P characteristics.
- c) Perform following binary subtractions using 2's complement.
 - 1) $(BC)_{16} - (AD)_{16}$
 - 2) $(763)_8 - (457)_8$

Section – II

Q.4 Attempt any four. 16

- a) What is Algorithm? Explain with example.
- b) What are the logical operators are used in C? Explain with example.
- c) Define - Variable, Constant, Data Type and Array with example.
- d) Write a C program to find largest number among user entered three numbers.
- e) What is Pointer? Explain with example.

Q.5 Attempt any two. 12

- a) What is string? Explain any four string-handling functions in C library.
- b) Write a program to display a factorial of a given number.
(e.g. Factorial of 4 = 4! = 1X2X3X4 = 24)
- c) Write a program to calculate summation of five array element.

Seat No.	
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F.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019
ENGINEERING GRAPHICS

Day & Date: Tuesday, 26-11-2019
Time: 10:00 AM To 02:00 PM

Max. Marks: 70

- Instructions:**
- 1) All questions are compulsory.
 - 2) Q.1 is objective type, return objective answer sheet to junior supervisor after first 40 minutes.
 - 3) Retain all construction lines.
 - 4) Assume suitable data if required and mention it.
 - 5) All dimensions are in mm
 - 6) Return all answer sheets to the junior supervisor irrespective of their use.
 - 7) Figures to the right indicate full marks.

Section I

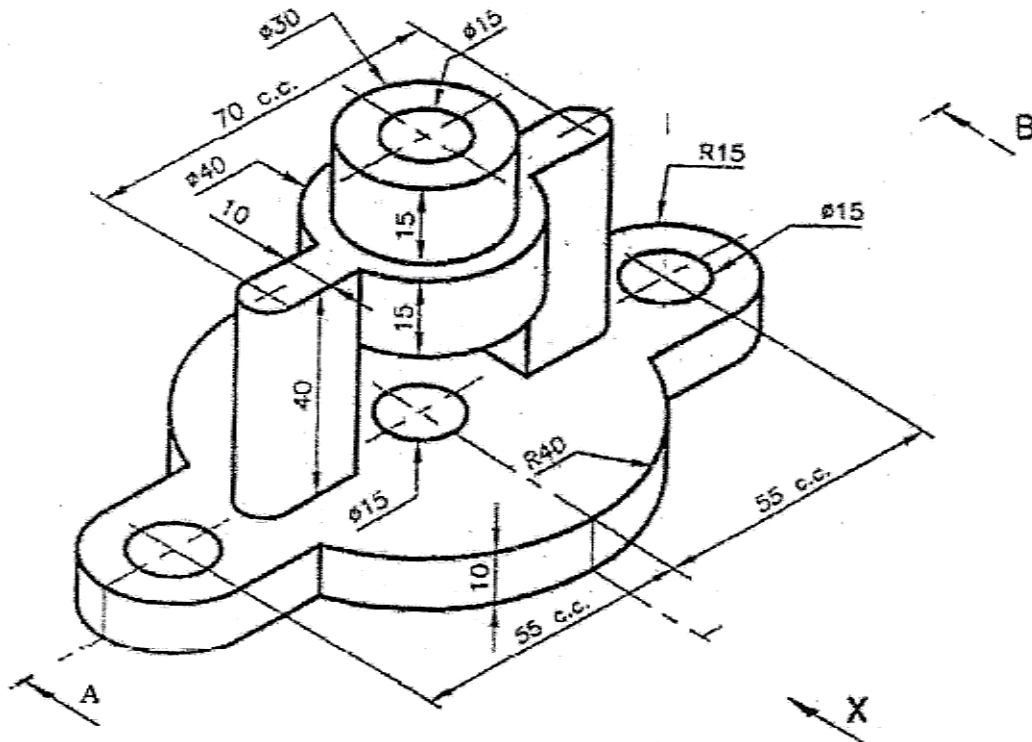
- Q.1 Solve any FOUR: (Objective Type)**
- a) Complete projections of Line AB, 70 mm long, having point B 50 mm above HRP, having bearing of S40E with respect to A. [Refer figure (a)] **03**
 - b) Complete projections of Line PQ, having grade 60%. Find Bearing of Line. [Refer figure (b)] **03**
 - c) Complete projections of Line PQ, perpendicular to Line AB. Find true length of PQ. [Refer figure (c)] **03**
 - d) Find strike and Dip of Plane PQR [Refer figure (d)] **04**
 - e) Complete projections of parallelogram ABCD. [Refer figure (e)] **03**
 - f) Draw front view of plane ABC having strike of S60W and dips 45°NW. [Refer figure (f)] **04**
- Q.2 Solve the following:**
- a) A line MN has grade 75% w.r.t. M, its bearing w.r.t. M is S45°E and its front view length is 60 mm. Draw the projections of line MN and find its true angle with VP. Point M is 15 mm above H.P and 15 mm in front of VP. **04**
 - b) Line AB, 50 mm long has bearing of S45°E and gradient of 100%. Draw its elevation and plan. Point A is 15 mm above HP and 15 mm in front of VP. **03**
 - c) Find the inclination of triangular plane PQR with VP. The coordinates of the points are: P (30,50,110), Q (50,20,140), R (90,70,100) **04**
- Q.3** A thin rectangular plate PQRS having sides PQ=RS=40 mm and QR= PS=70 mm is resting on one of its small sides PQ on HP. Its top view appears as square of sides 40 mm. Draw the projections of plate when PQ makes an angle of 40° with VP. **07**
- Q.4** A pentagonal prism side of base 50mm and height 80mm is held on a corner of its base on HP. The axis of the prism makes 50° with HP and 40° with VP. Draw the projections of the prism. **10**

OR

- A square pyramid, side of base 40 mm and axis length 60 mm is kept on HP on one of its base corners, in such a way that its axis makes 30° with HP and 45° with VP. Draw the projections of the pyramid keeping apex away from the observer. **10**

Section II

- Q.5** Figure shows a pictorial view of an object. Draw following views by using first angle projection method **14**
- Sectional elevation in the direction of 'X' along A-B
 - Left hand side view
 - Plan

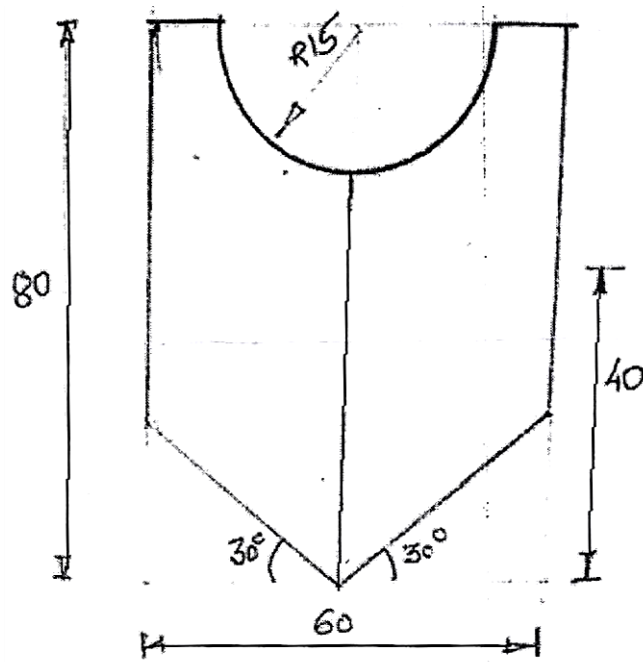


- Q.6** A tetrahedron with all sides 50mm rest on one of its corner in HP and tilts to have axis 45° to HP and parallel to VP. It is cut by section plane inclined to HP in such way that top view of section appears as trapezium with parallel sides 8mm and 36mm. Complete projection. Also find angle made by cutting plane with HP. **07**

OR

A cone of base circle diameter 50mm axis 75mm is lying on ground on one of its generator with its axis parallel to VP. It cut by horizontal section plane 20mm above ground. Draw Front view, sectional top view and true shape of section.

Q.7 Draw the development of lateral surfaces of cut hexagonal prism.



OR

A Hexagonal pyramid side of base 30 mm and axis 70 mm long is resting on base in HRP with a side parallel to FRP. It is cut by an auxiliary inclined plane passing through extreme right hand corner of base and inclined at 45° to HRP. Draw front view, top view and development of lateral surfaces of cut hexagonal pyramid.