

22103

23124

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following :

10

- (a) Find value of x if $\frac{\log x}{\log 4} = \frac{\log 64}{\log 16}$.
- (b) Find the area of triangle whose vertices are (0, 0), (3, 6) and (-8, -2) using determinant method.
- (c) Without using calculator find value of 'sin 15°'.
- (d) Calculate the surface area of the cube having length of one side as 5.3 cm.
- (e) If the volume of a room is 792 m³ and the area of the floor is 132 m², find the height of the room.
- (f) Find range and co-efficient of range of the following data 50, 90, 120, 9, 13, 11, 5.
- (g) If the mean of data is 12 and co-efficient of the data is 45%, then find the standard deviation of the data.



2. Attempt any THREE of the following :

12

(a) If $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$, then verify that $(AB)^T = B^T \cdot A^T$.

(b) Resolve into partial fractions,

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

(c) Calculate variance for the data :

| | | | | | |
|-------|----|----|----|----|----|
| x_i | 10 | 20 | 30 | 40 | 50 |
| f_i | 12 | 15 | 17 | 11 | 9 |

(d) Following equations are obtained as a result of an experiment

$$\alpha I_1 - I_2 + I_3 = 0, 4I_1 - I_3 = 2, 2I_2 + I_3 = 2, \text{ find } I_1, I_2, I_3 \text{ using Cramer's rule.}$$

3. Attempt any THREE of the following :

12

(a) Prove that $\tan\left(\frac{\pi}{4} + A\right) \cdot \tan\left(\frac{\pi}{4} - A\right) = 1$.

(b) If $\tan A = \frac{1}{3}$, $\tan B = \frac{1}{4}$ where $0 < A < \frac{\pi}{2}$, $\pi < B < \frac{3\pi}{2}$, find $\sin(A + B)$.

(c) Simplify $\frac{\sec^2(135^\circ)}{\cos(-240^\circ) - 2\sin(930^\circ)}$.

(d) Prove that $\frac{\sin 4\theta + \sin 2\theta}{1 + \cos 2\theta + \cos 4\theta} = \tan 2\theta$.

4. Attempt any THREE of the following :

12

(a) If $A = \begin{bmatrix} x & 2 & -5 \\ 3 & 1 & 2y \end{bmatrix}$, $B = \begin{bmatrix} 2y+5 & 6 & -15 \\ 9 & 3 & -6 \end{bmatrix}$ and if $3A = B$, find x and y .

(b) Resolve into partial fraction,

$$\frac{x^2 + 1}{x^3 + 1}.$$

- (c) Show that $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 80^\circ = \frac{1}{8}$.
- (d) Prove that $\frac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x \cdot \cot x$.
- (e) Prove that $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right) = \cot^{-1}(2)$.

5. Attempt any TWO of the following :

12

(A) Attempt the following :

- (i) Find the equation of the straight line passing through $(-3, 10)$ and sum of their intercept is 8.
- (ii) Find the equation of straight line passing through the points $(-4, 6)$ and $(8, -3)$.

(B) Attempt the following :

- (i) Find the equation of a straight line that passes through point $(3, 4)$ and perpendicular to the line $3x + 2y + 5 = 0$.
- (ii) Find acute angle between line $3x - 2y + 4 = 0$ and $2x - 3y - 7 = 0$

(C) Attempt the following :

- (i) The area of a rectangular courtyard is 3000 sq.m. Its sides are in the ratio 6 : 5. Find the perimeter of the courtyard.
- (ii) A swimming pool is 12 m long and 7.5 m broad. It is 2.5 m deep at its deep end and 1.4 m deep at its shallow end. Calculate its capacity in kilolitres.

6. Attempt any TWO of the following :

12

- (a) Solve the following equation by using matrix inversion method :

$$x + 2y + 3z = 1, 2x + 3y + 2z = 2 \text{ \& } 3x + 2y + 4z = 1$$

- (b) Find the mean deviation from mean of the following data :

| | | | | | |
|------------------------|--------|---------|---------|---------|---------|
| Marks | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 |
| No. of Students | 5 | 8 | 15 | 16 | 6 |

- (c) Attempt the following :

- (i) Find range and co-efficient of range of the following :

| | | | | | |
|-------|----|----|----|----|----|
| x_i | 10 | 20 | 30 | 40 | 50 |
| f_i | 7 | 5 | 3 | 2 | 1 |

- (ii) The runs scored by two batsmen A and B in 5 one day matches are given below :

| | | | | | |
|----------|----|----|----|----|----|
| A | 48 | 50 | 39 | 46 | 37 |
| B | 50 | 52 | 60 | 55 | 53 |

Who is more consistent ?
