

# 22103

**21222**

**3 Hours / 70 Marks**

Seat No. 

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15 minutes extra for each hour

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

**Marks**

**1. Solve any FIVE of the following: 10**

- a) Find value of  $\log\left(\frac{2}{3}\right) + \log\left(\frac{4}{5}\right) - \log\left(\frac{8}{15}\right)$ .
- b) Show that the points (8, 1), (3, -4), (2, -5) are collinear.
- c) Without using calculator find value of  $\sin(105^\circ)$ .
- d) Find area of Rhombus where diagonals are of length 6 cm and 9 cm.
- e) Find surface area of cuboid whose dimensions are 8 cm  $\times$  11 cm  $\times$  15 cm.
- f) If coefficient of variance is 5 and mean is 60. Find standard deviation.
- g) Find range and coefficient of range for the data: 40, 52, 47, 28, 45, 36, 47, 50.
- h) Find surface area of sphere whose volume is  $\frac{4\pi}{3}$  cm<sup>3</sup>.

P.T.O.

2. Solve any THREE of the following:

12

a) If  $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$  prove that  $A^2 = I$ .

b) Resolve following into partial fraction  $\frac{x + 3}{(x - 1)(x + 1)(x + 5)}$

c) Following results are obtained as a result of experiment.  
Find  $V_1, V_2, V_3$  by using Cramer's Rule.

$$V_1 + V_2 + V_3 = 9, \quad V_1 - V_2 + V_3 = 3, \quad V_1 + V_2 - V_3 = 1$$

d) Compute mean deviation for the mean of the data:  
12, 6, 7, 3, 15, 10, 18, 5.

3. Solve any THREE of the following:

12

a) Solve without using calculator,  
 $\sin(420^\circ) \cos(390^\circ) + \sin(-330^\circ) \cos(-300^\circ)$

b) Prove :  $\frac{\sin 4\theta + \sin 2\theta}{1 + \cos 2\theta + \cos 4\theta} = \tan 2\theta$

c) Prove that :  $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$

d) Prove :  $\tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{1}{3}\right)$

4. Solve any THREE of the following:

12

a) Find  $x$  and  $y$  if

$$\left\{ 4 \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 3 \end{bmatrix} - 2 \begin{bmatrix} 1 & 3 & -1 \\ 2 & -3 & 4 \end{bmatrix} \right\} \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

b) Resolve into partial fractions:  $\frac{3x - 2}{(x + 2)(x^2 + 4)}$

c) Prove :  $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 80^\circ = \frac{1}{8}$

- d) If  $\tan(x + y) = \frac{3}{4}$  and  $\tan(x - y) = \frac{1}{3}$ . Find  $\tan 2x$ .
- e) If  $\sin A = \frac{1}{2}$ . Find  $\sin 3A$ .

**5. Solve any TWO of the following:**

**12**

- a) Attempt the following:
- Find equation of line passing through points  $(6, -4)$  and  $(-3, 8)$ .
  - Find distance between parallel lines  $3x + 2y - 5 = 0$  and  $3x + 2y - 6 = 0$ .
- b) Attempt the following:
- Find equation of line passing through point  $(2, 0)$  and perpendicular to  $x + y + 3 = 0$ .
  - Find acute angle between the lines  $3x - y + 4 = 0$  and  $2x + y = 3$ .
- c) Attempt the following:
- Find the area of ring between two concentric circles whose circumferences are 77 cm and 55 cm.
  - The area of piece of land is in the form of a quadrilateral ABCD. The diagonal AC is 400m long off-set to B is 220m and off-set to D is 98m. Find the area.

6. Solve any TWO of the following:

12

- a) Find the mean and standard deviation and coefficient of variance of the following data:

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	8	3	1

- b) Attempt the following:

- i) Find range and coefficient of range for following data:

Marks	10-19	20-29	30-39	40-49	50-59	60-69
No. of students	6	10	16	14	8	4

- ii) The two sets of observations are given below:

Set I	Set II
$\bar{x} = 82.5$	$\bar{x} = \text{mean} = 48.75$
$\sigma = \text{S.D} = 7.3$	$\sigma = \text{S.D} = 8.35$

Which of two sets is more consistent?

- c) Solve the following equations by matrix inversion method.

$$x + y + z = 3, \quad x + 2y + 3z = 4, \quad x + 4y + 9z = 6.$$


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