

311302

23124

3 Hours / 70 Marks

Seat No.

1 9 3 3 4 4

- 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) 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
	10
<b>1. Attempt any FIVE of the following :</b>	
(a) Find the value of $x$ if, $\log_5(x^2 - 5x + 11) = 1$	
(b) Find the value of $\sin(15^\circ)$ using compound angles.	
(c) Find the intercepts of the line $2x + 3y = 6$ on both the axes.	
(d) State whether the function is even or odd if, $f(x) = x^3 + 4x + \sin x$ .	
(e) At which point on the curve $y = 3x - x^2$ the slope of the tangent is $-5$ ?	
(f) Divide 100 into two parts such that their product is maximum.	
(g) If mean is 34.5 and standard deviation is 5, find the co-efficient of variance.	



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## 2. Attempt any THREE of the following :

- (a) If  $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$ , then

Find the matrix 'X' such that

$2X + 3A - 4B = I$ , where  $I$  is identity matrix of order 2.

- (b) If  $A = \begin{bmatrix} -2 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & 1 \\ 3 & 5 \\ 0 & 2 \end{bmatrix}$ , whether  $AB$  is singular or non-singular matrix ?

- (c) Resolve into partial fraction  $\frac{3x-2}{(x+2)(x^2+4)}$ .

- (d) If  $A$  and  $B$  are obtuse angle and  $\sin A = \frac{5}{13}$  and  $\cos B = \frac{-4}{5}$ , then find  $\sin(A+B)$ .

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## 3. Attempt any THREE of the following :

- (a) Prove that,  $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$

- (b) Prove that  $\sin^{-1}\left(\frac{3}{5}\right) - \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{84}{85}\right)$ .

- (c) Find the equation of straight line passing through the point of intersection of lines  $4x + 3y = 8$  and  $x + y = 1$ ; and parallel to the line  $5x - 7y = 3$ .

- (d) Find  $\frac{dy}{dx}$ , if  $x^3 + xy^2 = y^3 + yx^2$ .

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## 4. Attempt any THREE of the following :

- (a) If  $x = a(\theta + \sin \theta)$  &  $y = a(1 - \cos \theta)$ , find  $\frac{dy}{dx}$  at  $\theta = \frac{\pi}{2}$ .

- (b) If  $y = (x)^{\sin x} + (\tan x)^x$ , find  $\frac{dy}{dx}$ .

- (c) Find the range and co-efficient of range for the following data :

Class Interval	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59
Frequency	15	25	13	17	10

- (d) Calculate the mean deviation about mean of the following data :

17, 15, 18, 23, 25, 22, 11, 5

- (e) The following data pertains to two workers doing the same job in a factory :

Details	Worker A	Worker B
Mean time of completing job	40	42
Standard deviation	8	6

Who is more consistent worker ?

#### 5. Attempt any TWO of the following :

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- (a) Solve the following system of equations by matrix inversion method :

$$x + y + z = 3, \quad 3x - 2y + 3z = 4, \quad 5x + 5y + z = 11$$

- (b) (i) If  $\tan\left(\frac{A}{2}\right) = \frac{1}{\sqrt{3}}$ , find the value of  $\cos A$ .

- (ii) Evaluate without using calculator

$$\frac{\tan 85^\circ - \tan 40^\circ}{1 + \tan 85^\circ \cdot \tan 40^\circ}$$

- (c) (i) Find the distance between the parallel lines  $3x + 2y = 5$  and  $3x + 2y = 6$ .

- (ii) Find the acute angle between the line,  $3x = y - 4$  and  $2x + y + 3 = 0$ .

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#### 6. Attempt any TWO of the following :

- (a) A manufacturer can sell ' $x$ ' items at a price of ₹  $(330 - x)$  each. The cost of producing  $x$  items is ₹  $(x^2 + 10x + 12)$ . Determine the number of items to be sold so that the manufacturer can make the maximum profit.

- (b) A beam is bent in the form of curve  $y = 2 \sin x - \sin 2x$ . Find radius of curvature of the beam at  $x = \frac{\pi}{2}$ .
- (c) Find mean, standard deviation and co-efficient of variance of the following data :

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15