311302

23124

3 Hours / 70 Marks Seat No. [redacted]

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

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

(a) Find the value of x if, $\log_5 (x^2 - 5x + 11) = 1$

(b) Find the value of sin (15°) 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.

12

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

$\sin (A + B)$.

12

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 $x^3 + xy^2 = y^3 + yx^2$.

12

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 : **12**

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

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

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

(ii) Evaluate without using calculator

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

(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 $2x + y + 3 = 0$.

6. Attempt any TWO of the following : **12**

(a) A manufacturer can sell 'x' items at a price of ₹ $(330 - x)$ each. The cost of producing x items in ₹ $(x^2 + 10x + 12)$. 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