

311302

23124

3 Hours / 70 Marks

Seat No.

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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) 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 $\sin (15^\circ)$ 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.



2. Attempt any THREE of the following :**12**

(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

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

(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 $\sin(A+B)$.

3. Attempt any THREE of the following :**12**

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

4. Attempt any THREE of the following :**12**

(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

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

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

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.

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- (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

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Marks

1. Attempt any FIVE :

10

- (a) Find the value of $\log\left(\frac{2}{3}\right) + \log\left(\frac{4}{5}\right) - \log\left(\frac{8}{15}\right)$.
- (b) Without using calculator, find the value of $\cos(135^\circ)$.
- (c) If $f(x) = x^3 - \frac{1}{x^3}$, show that $f(x) + f\left(\frac{1}{x}\right) = 0$.
- (d) State whether the function $f(x) = \frac{e^x + e^{-x}}{2}$ is even or odd.
- (e) Find $\frac{dy}{dx}$ if $y = x^2 e^x$.
- (f) Find range & coefficient of range for the runs scored by cricket player in eight innings 45, 42, 39, 40, 48, 41, 45, 44.
- (g) If mean is 34.5 & S.D. (σ) is 5, find C.V. (Coefficient of Variance).



2. Attempt any THREE :**12**

- (a) If $P = \begin{bmatrix} 1 & 2 & -3 \\ 3 & -1 & 2 \\ -2 & 1 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$, then find matrix R such that $P + Q + R = 0$.

- (b) Resolve into partial fraction $\frac{x^2 - 2x + 3}{(x + 2)(x^2 + 1)}$.

- (c) Without using calculator, find the value of $\sin 150^\circ + \cos 300^\circ - \tan 315^\circ + \sec^2 360^\circ$.

- (d) Find mean deviation from mean for the data :

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

3. Attempt any THREE :**12**

- (a) Prove that $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$.

- (b) Prove that $\sqrt{2 + \sqrt{2 + \cos 4\theta}} = 2 \cos \theta$.

- (c) Show that $\tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{1}{3}\right)$.

- (d) If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$, then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.

4. Attempt any THREE :**12**

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

show that AB is singular or non-singular matrix.

- (b) Find $\frac{dy}{dx}$ if $y = (\sin x)^x$.

- (c) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4xy$.
- (d) Find $\frac{dy}{dx}$ if $y = \tan^{-1} \left(\frac{a+x}{1-ax} \right)$.
- (e) A metal wire 36 cm long bent to form a rectangle. Find its dimensions when area is maximum.

5. Attempt any TWO :**12**

- (a) (i) Find the equation of straight line passes through the points $(-4, 6)$ & $(8, -3)$.
- (ii) Find the equation of line passing through $(2, 5)$ & through the intersection of lines $x + y = 0$ & $2x - y = 9$.
- (b) (i) Find the angle between the lines $x + 5y = 11$ & $5x - y = 11$.
- (ii) Find the perpendicular distance of the point $(-3, 4)$ from the line $4(x + 2) = 3(y - 4)$.
- (c) (i) A beam is bent in the form of curve $y = 2 \sin x - \sin 2x$. Find the radius of curvature of beam at point $x = \frac{\pi}{2}$.
- (ii) Find the equation of tangent to the curve $4x^2 + 9y^2 = 40$ at $(1, 2)$.

6. Attempt any TWO :**12**

- (a) Using matrix-inversion method, solve the following system of equations :

$$x + y + z = 6; 3x - y + 3z = 10; 5x + 5y - 4z = 3$$

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- (b) (i) Find mean of the following distribution :

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

- (ii) An analysis of monthly wages paid to the workers in two firms A & B belonging to the same industry gives following data :

	Firm-A	Firm-B
Average monthly wages (in ₹)	186	175
Variance of distribution of wages (in ₹)	81	100

Which firm is more consistent ?

- (c) Calculate mean and standard deviation and coefficient of variation of the following data :

C.I.	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15
