

311302

25226

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 $\log_3 x - \log_3 (x - 2) = 3$.
- (b) Prove that $\cos (\pi + \theta) = -\cos \theta$.
- (c) Find the value of k , if the lines $kx - 6y = 9$ & $6x + 5y = 13$ are perpendicular to each other.
- (d) If $f(x) = x^4 - 2x + 7$, find $f(0) + f(2)$.
- (e) Find $\frac{dy}{dx}$, if $y = x \cdot \sin x$.
- (f) Find the radius of curvature to the curve $y = x^3$ at $(1, 1)$.
- (g) Find range and co-efficient of range for the data :
7, 14, 9, 12, 8



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

(a) If $\left\{ 5 \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix} - 3 \begin{bmatrix} 1 & 2 \\ -2 & 3 \\ 3 & 1 \end{bmatrix} \right\} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ then, find x, y & z .

(b) If $A = \begin{bmatrix} -1 & 5 & 1 \\ 2 & 3 & 4 \\ 7 & 0 & 9 \end{bmatrix}$, find $\text{Adj}(A)$.

(c) Resolve into partial fractions : $\frac{x-5}{x(x+3)(x-2)}$.

(d) Without using the calculator, prove that

$$\tan(210^\circ) \cot(390^\circ) - \tan(420^\circ) \cot(240^\circ) = 0$$

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

(a) Prove that : $\frac{1 + \sin \theta - \cos \theta}{1 + \sin \theta + \cos \theta} = \tan\left(\frac{\theta}{2}\right)$

(b) Prove that : $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$

(c) Find the equation of line passing through the point of intersection of the lines $x + y = 0$ & $2x - y = 9$ and passing through the point $(2, 5)$.

(d) If $13x^2 + 2x^2y + y^3 = 1$, find $\frac{dy}{dx}$ at $(1, -2)$.

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

(a) If $x = a \sin^3 \theta$, $y = a \cos^3 \theta$, then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$.

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

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

Max. Temp	25-26	27-28	29-30	31-32	33-34	35-36
No. of Days	2	11	12	10	4	1

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

Weight of Wood Logs (in kgs)	10-20	20-30	30-40	40-50	50-60	60-70
No. of Logs	4	6	10	18	9	3

- (e) The runs scored by two batsman A & B in 5 one day matches are given below :

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

Using co-efficient of variation, identify the more consistent batsman.

5. Attempt any TWO of the following :

12

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

$$x + 3y + 2z = 6, 3x - 2y + 5z = 5, 2x - 3y + 6z = 7$$

- (b) (i) If
- $\tan A = \frac{1}{2}$
- ,
- $\tan B = \frac{1}{3}$
- , find the value of
- $\tan(A + B)$
- .

(ii) Simplify $\frac{\cos^2(180^\circ - \theta)}{\sin(-\theta)} + \frac{\cos^2(270^\circ + \theta)}{\sin(180^\circ + \theta)}$

- (c) (i) Find the length of the perpendicular from
- $(-3, -4)$
- on to the line
- $4(x + 2) = 3(y - 4)$
- .

- (ii) Find the acute angle between the lines
- $2x + 3y = 5$
- &
- $3x - 2y = 6$
- .

P.T.O.

6. Attempt any TWO of the following :

12

(a) (i) Find the equation of tangent to the curve $x = \frac{1}{t}$, $y = t - \frac{1}{t}$, when $t = 2$.

(ii) Find radius of curvature of the curve $y = e^x$ at point $x = 0$.

(b) (i) Divide 80 into two parts such that their product is maximum.

(ii) Find maximum or minimum value of $y = x^2 - 4x + 2$.

(c) Find variance & co-efficient of variance for the following data :

Rainfall	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
No. of places	6	7	12	19	21	18	11	6
