**12425**

**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 '$x$', if $\log_2 (x + 2) = 3$

(b)  If sin A = 0.4, find the value of sin 3A.

(c)  Find the acute angle between the lines whose slopes are $\sqrt{3}$ and $\dfrac{1}{\sqrt{3}}$.

(d)  If f($x$) = $3x^2 - 5x + 7$, show that f(−1) = 3 f(1).

(e)  Find $\dfrac{dy}{dx}$, if y = $a^x + x^a + e^a + \log_a x$.

(f)  Find $\dfrac{dy}{dx}$, if y = $e^x \cdot \sin^{-1}x$.

(g)  Find the range and coefficient of the range of the following :

2, 3, 1, 10, 6, 31, 17, 20, 24

[1 of 4]     **P.T.O.**

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

(a) If $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$, verify that $(AB)^T = B^T A^T$.

(b) Resolve into partial fraction $\dfrac{x}{x^2 - x - 2}$.

(c) Simplify $\dfrac{1}{\log_5 10} + \dfrac{1}{\log_{20} 10}$.

(d) If $\tan x = \dfrac{5}{6}$ and $\tan y = \dfrac{1}{11}$, show that $x + y = \dfrac{\pi}{4}$.

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

(a) Prove that $\dfrac{\cos A}{1 - \tan A} + \dfrac{\sin A}{1 - \cot A} = \sin A + \cos A$.

(b) Without using calculator, prove that

$$\cos 20° \cdot \cos 40° \cdot \cos 60° \cdot \cos 80° = \frac{1}{16}$$

(c) Find the equation of straight line passing through the point of intersection of $x + y = 4$ and $2x + y = 4$ and parallel to $x$-axis.

(d) Find $\dfrac{dy}{dx}$, if $x^3 + y^3 = 30xy$.

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

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

(b) Find maximum and minimum value of the function $y = 2x^3 - 21x^2 + 36x - 20$.

(c) Compute mean deviation for

15, 22, 27, 11, 9, 21, 14, 9

(d) Calculate mean and Standard Deviation of the following frequency distribution :

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

$4\sqrt{10}$ or 12.6491

(e) Find variance and coefficient of variance for the following distribution :

| Class Interval | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 | 60 – 70 |
|---|---|---|---|---|---|---|
| Frequency | 4 | 6 | 10 | 18 | 9 | 3 |

41.2
12.9321

3.5961
8.7283

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

(a) Solve the following by matrix inversion method :

$3x + y + 2z = 3;\ 2x - 3y - z = -3;\ x + 2y + z = 4$

(b) (i) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$.

(ii) If $\sin\theta = \frac{15}{17}$, where $\theta$ lies in 2nd quadrant. Find the value of $\tan\theta$.

(c) (i) Find the length of perpendicular from the point (5, 4) on the straight line $2x + y = 34$.   $\frac{10}{\sqrt{26}}$

(ii) Find the equation of a straight line that passes through (3, 4) and perpendicular to the line $3x + 2y + 5 = 0$.   $\frac{22}{5}$ or 4.4

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

(a) Find the equation of tangent and normal to the curve $4x^2 + 9y^2 = 40$ at point (1, 2).

(b) (i) Find the radius of curvature of the curve $y = x^3$ at point (2, 8).

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

(c) The scores of two batsmen/batter A and B in ten innings during a certain season as under :

| A | 32 | 28 | 47 | 63 | 71 | 39 | 10 | 60 | 96 | 14 | 460 |
|---|----|----|----|----|----|----|----|----|----|----|-----|
| B | 19 | 31 | 48 | 53 | 67 | 90 | 10 | 62 | 40 | 80 | 500 |

Find which of two batsmen/batter is more consistent in scoring. Why ?

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