



22103

11718

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) *Assume suitable data, if necessary.*
 - (6) *Use of Non-programmable Electronic Pocket Calculator is permissible.*

Marks

1. Attempt any five of the following :

10

- a) Evaluate $\log_3 81$.
- b) Show that the points (8, 1) (3, -4) and (2, -5) are collinear using determinant.
- c) Without using calculator find the value of $\sin(105^\circ)$.
- d) Find the area of a rhombus whose diagonals are of lengths 10 cm and 8.2 cm.
- e) If the volume of a sphere is $\frac{4\pi}{3} \text{ cm}^3$. Find its surface area.
- f) Find the range and coefficient of range of the data :
50, 90, 120, 40, 180, 200, 80.
- g) If the coefficient of variation of certain data is 5 and mean is 60. Find the standard deviation.

2. Attempt any three of the following :

12

- a) If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$ whether AB is singular or non-singular matrix ?
- b) Resolve into partial fractions $\frac{x+3}{(x-1)(x+1)(x+5)}$.
- c) Using Cramer's rule solve $x - y - 2z = 1$; $2x + 3y + 4z = 4$; $3x - 2y - 6z = 5$.
- d) Compute the standard deviation for 15, 22, 27, 11, 9, 21, 14, 9.

P.T.O.



3. Attempt **any three** of the following :

a) If $\tan(x+y) = \frac{3}{4}$ and $\tan(x-y) = \frac{8}{15}$. Prove that $\tan 2x = \frac{77}{36}$.

b) If $A = 30^\circ$, verify that

i) $\sin 2A = 2 \sin A \cos A$

ii) $\cos 2A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$.

c) Prove that $\cos 20 \cos 40 \cos 60 \cos 80 = \frac{1}{16}$.

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

4. Attempt **any three** of the following :

12

a) If $A = \begin{bmatrix} 2 & 5 & 6 \\ 0 & 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 6 & 1 \\ 0 & 4 \\ 5 & 7 \end{bmatrix}$. Verify that $(AB)^T = B^T A^T$.

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

c) Prove that $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$.

d) If $\sin A = \frac{1}{2}$ find the value of $\sin 3A$.

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

5. Attempt **any two** of the following :

12

a) i) Find the equation of straight line passes through the points (3, 5) and (4, 6).

ii) Find the distance between the parallel lines $3x - y + 7 = 0$ and $3x - y + 16 = 0$.

b) i) Find the acute angle between the lines $2x + 3y + 5 = 0$ and $x - 2y - 4 = 0$.

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

c) i) The area of a rectangular courtyard is 3000 sq.m. Its sides are in the ratio 6 : 5. Find the perimeter of courtyard.

ii) A circus tent is cylindrical to a height of 3m and conical above it. If its diameter is 105 m and slant height of cone is 5m, calculate the area of total canvas required.



[3]

22103**Marks****12****6. Attempt any two:**

- a) Using matrix inversion method, solve $x + y + z = 3$; $x + 2y + 3z = 4$; $x + 4y + 9z = 6$.
- b) Find mean, standard deviation and coefficient of variance of the following :

Class :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency :	3	5	8	3	1

- c) i) Calculate the range and coefficient of range for the following data :

Class :	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45
Frequency :	4	16	38	12	10

- ii) The two sets of observations are given below. Which of them is more consistent ?

Set I

$$\bar{x} = 82.5$$

$$\sigma = 7.3$$

Set II

$$\bar{x} = 48.75$$

$$\sigma = 8.35$$
