11920

3 Hours / 70 Marks   Seat No.

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)   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 $\log_3 (x + 6) = 2$.

(b)   Find the area of triangle whose vertices are $(-3, 1)$, $(1, -3)$ and $(2, 3)$.

(c)   Without using calculator, find the value of $\cos (-765°)$.

(d)   Find the length of the longest pole that can be placed in a room 12 m long 9 m broad and 8 m high.

(e)   Find the volume of the sphere whose surface area is 616 sq. m.

(f)   If mean is 82 and standard deviation is 7, find the coefficient of variance.

(g)   Find range and coefficient of range for the data :

3, 7, 11, 2, 16, 17, 22, 20, 19

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

(a) 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.

(b) Resolve into partial fraction :

$$\frac{2x + 3}{x^2 - 2x - 3}$$

(c) The voltages in an circuit are related by the following equations :

$$V_1 + V_2 + V_3 = 9$$

$$V_1 - V_2 + V_3 = 3$$

$$V_1 + V_2 - V_3 = 1$$

Find V_1, V_2, V_3 by using Cramer's Rule.

(d) Compute standard deviation for the following data :

1, 2, 3, 4, 5, 6, 7

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

(a) Simplify :

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

(b) Prove that :

$$1 + \tan \theta . \tan 2\theta = \sec 2\theta.$$

(c) Prove that :

$$\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A.$$

(d) Prove that :

$$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}.$$

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

(a) If $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ verify $(AB)^T = B^T A^T$.

(b) Resolve in to partial fraction :

$$\frac{3x - 2}{(x + 2)(x^2 + 4)}$$

(c) Without using calculator, prove that

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

(d) Prove that :

$$\tan A \cdot \tan(60 - A) \cdot \tan(60 + A°) = \tan 3A$$

(e) If $\angle A$ and $\angle B$ are obtuse angles and $\sin A = \frac{12}{13}$, $\cos B = \frac{-4}{5}$,

find $\cos(A + B)$.

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

(a) Attempt the following :

(i) Find length of perpendicular from the point P (2, 5) on the line $2x + 3y - 6 = 0$.

(ii) Find the equation of line passing through (2, 3) and having slope 5 units.

(b) Attempt the following :

(i) Find the equation of the line passing through the point (2, 3) and perpendicular to the line $3x - 5y = 6$.

(ii) Find the acute angle between the lines $3x - y = 4$, $2x + y = 3$.

(c) Attempt the following :

    (i) A cylinder has hemispherical ends having radius 14 cm and height 50 cm. Find the total surface area.

    (ii) A solid right circular cone of radius 2 m and height 27 m is melted and recasted into a sphere. Find the volume and surface area of the sphere.

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

(a) Find the mean, standard deviation and coefficient of variance of the following data :

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

(b) Attempt the following :

    (i) From the following data, calculate range and coefficient of range :

Marks	10-19	20-29	30-39	40-49	50-59	60-69
No. of Students	6	10	16	14	8	4

    (ii) The two set of observations are given below :

Set I	Set II
$\bar{x} = 82.5$	$\bar{x} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

Which of two sets is more consistent ?

(c) Solve the following equations by matrix inversion method :

$x + y + z = 3$

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

$5x + 5y + z = 11$

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