

22103

11920

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) 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  $\cos(-765^\circ)$ .
- (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

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P.T.O.

## 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 :

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

(b) Prove that :

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

(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

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

(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  $3x - y = 4$ ,  $2x + y = 3$ .

P.T.O.

(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 :

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

(b) Attempt the following :

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

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

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

<b>Set I</b>	<b>Set II</b>
$\bar{x} = 82.5$	$\bar{x} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

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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