

17104

11718

3 Hours / 100 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.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any TEN of the following: 20

a) Find the value of 'P' if
$$\begin{vmatrix} P & 4 & -4 \\ 3 & -2 & 1 \\ -2 & -4 & 1 \end{vmatrix} = 0$$

b) If $A = \begin{bmatrix} 1 & -2 \\ 4 & 3 \end{bmatrix}$ find matrix X such that

$$A + 2X = \begin{bmatrix} 3 & 6 \\ 0 & 1 \end{bmatrix}$$

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

P.T.O.

- d) If $A = \begin{bmatrix} 2 & 4 \\ -1 & -2 \end{bmatrix}$ show that A^2 is a null matrix.
- e) Resolve into partial fraction $\frac{1}{x^2 + x}$
- f) Prove that $\frac{\sin 2\theta}{\sin \theta} - \frac{\cos 2\theta}{\cos \theta} = \sec \theta$
- g) Evaluate: $2 \cos 75^\circ \cos 15^\circ$
- h) Find the principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$
- i) Without using calculator find the value of $\sin\left(\frac{\pi}{12}\right)^c$.
- j) If $\tan\left(\frac{A}{2}\right) = \frac{1}{\sqrt{3}}$ find $\sin A$.
- k) Find the slope and X – intercept of the line $\frac{x}{2} - \frac{y}{3} = \frac{1}{4}$
- l) Find the range and coefficient of range of the data
5, 25, 65, 55, 35, 45, 15.

2. Attempt any FOUR of the following:

16

- a) Solve the following equations by using Cramer's rule.

$$3x + 3y - z = 11, \quad 2x - y + 2z = 9, \quad 4x + 3y + 2z = 25$$

- b) If $A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 3 & 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 0 & 2 \\ 1 & 4 & 5 \\ 2 & 1 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

such that $(A + 2B) C = X$ find x, y, z .

- c) If $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ find A^{-1} by using adjoint method.

- d) If $A = \begin{bmatrix} 3 & 1 & -1 \\ 3 & 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 \\ 2 & 0 \\ 3 & -1 \end{bmatrix}$, $C = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$

verify that $A(BC) = (AB) C$

- e) Resolve into partial fraction $\frac{x+3}{(x^2-1)(x+5)}$
- f) Resolve into partial fraction $\frac{e^x}{e^{2x}+4e^x+3}$

3. Attempt any FOUR of the following: 16

- a) Solve the simultaneous equations by using matrix inversion method $2x + 3y - z = -3$, $5x + y + 3z = 10$, $4x + 3y - 2z = -3$
- b) Resolve into partial fraction $\frac{x^3+x}{x^2-9}$
- c) Resolve into partial fraction $\frac{x^2-2x+3}{x^3+x}$
- d) Prove that $\frac{\cos 3A \sin 9A - \sin A \cos 5A}{\cos A \cos 5A - \sin 3A \sin 9A} = \tan 8A$
- e) Prove that $\sin(A+B) = \sin A \cos B + \cos A \sin B$
- f) Prove that $\cot^{-1}\left(\frac{6}{5}\right) + \tan^{-1}\left(\frac{1}{11}\right) = \sec^{-1}(\sqrt{2})$

4. Attempt any FOUR of the following: 16

- a) Without using calculator find the value of $\sin(150)^\circ + \cos(300)^\circ - \tan(315)^\circ + \sec^2(3660)^\circ$
- b) In any $\triangle ABC$, $A + B + C = \pi$ prove that $\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \sin C$
- c) Show that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$
- d) If $x > 0$, $y > 0$ and $xy < 1$ then prove that $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \left(\frac{x+y}{1-xy} \right)$

- e) Prove that $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\cot 2A}{\cot 8A}$
- f) Prove that $\sin^{-1}\left(\frac{3}{5}\right) - \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{84}{85}\right)$

5. Attempt any FOUR of the following:

16

- a) If $\sin \alpha = \frac{12}{13}$, $\cos \beta = \frac{3}{5}$, $\frac{\pi}{2} < \alpha < \pi$ and $0 < \beta < \frac{\pi}{2}$
find $\cos(\alpha + \beta)$.
- b) Show that $\cos 59^\circ + \sin 59^\circ = \sqrt{2} \cos 14^\circ$
- c) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$
- d) If p is the length of the perpendicular from a point $p(x_1, y_1)$
to the line $ax + by + c = 0$ then prove that $P = \left| \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}} \right|$
- e) Find the equation of line passing through $(-1, 1)$ and making
an angle $\frac{\pi}{4}$ with the line $2x + 3y = 6$.
- f) Find the co-ordinates of the foot of perpendicular drawn from
 $(3, 4)$ to the straight line $4x - 2y + 9 = 0$.

6. Attempt any FOUR of the following:

16

- a) Show that the points $(6, 1)$, $(-1, 8)$ and $(3, -2)$ are the vertices
of right angled triangle by using slopes.
- b) Show that the distance between two parallel lines

$$ax + by + 4 = 0 \text{ and } ax + by + c_2 = 0 \text{ is } d = \left| \frac{c_2 - c_1}{\sqrt{a^2 + b^2}} \right|$$

- c) Following are the marks obtained by two students A and B.

Marks obtained by A	44	80	76	48	52	72	68	56	60	64
Marks obtained by B	48	75	54	60	63	69	72	51	57	56

which of the two students is more consistent?

- d) Calculate standard deviation of following frequency distribution.

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

- e) Find the mean deviation from median of the following data.

Weight of wood logs (in kg)	10-20	20-30	30-40	40-50	50-60	60-70
Number of logs	4	6	10	18	9	3

- f) Find the coefficient of variance of the following data.

Expenditure:	5	10	15	20	25
No. of students:	6	16	28	38	46
