17104

15116

3 Hours / 100 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) 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 missing term, if $\begin{vmatrix} 4 & 3 & 9 \\ 3 & -2 & 7 \\ 11 & 4 & -- \end{vmatrix} = 0$

(b) If $\begin{bmatrix} 3 & -6 \\ 4 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 3 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, find a, b, c, d

(c) If $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$, find X such that $2X + 3A - 4B = I$.

(d) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix}$, find $A^T + B^T$ and $A^T - B^T$.

(e) Resolve into the partial fraction $\frac{1}{x^3 + 3x^2 + 2x}$

(f) Prove that $\cos A = \cos^2(A/2) - \sin^2(A/2)$

(g) Without using calculator find the value of $\sin 75°$.

(h) Without using calculator find the value of $\cos (3660)$.

(i) Prove that $\sin (A + \pi/6) - \sin(A - \pi/6) = \cos A$

P.T.O.

(j) Prove that $\cos[\sin^{-1}(3/5)] = \frac{4}{5}$

(k) State the condition of two lines are parallel and perpendicular to each other.

(l) Calculate the range from the following data :

Weight in kg : 70, 75, 69, 80, 85, 83, 65, 89, 73, 84, 90

2. Attempt any FOUR of the following : **16**

(a) Solve the following equations by using Cramer's Rule :

$$\frac{5}{x+2} + \frac{3}{y+1} = 2$$

$$\frac{10}{x+2} - \frac{3}{y+1} = 1$$

(b) Find x, y, z if $\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & z \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 1 & 6 \\ 0 & -1 & 6 \\ 6 & 4 & 8 \end{bmatrix}$

(c) If $A = \begin{bmatrix} 2 & 1 & 0 \\ -1 & 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 3 & 0 \\ 0 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$, find $(AB) \cdot C$.

(d) Find Inverse of Matrix, $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$

(e) Resolve into partial fractions, $\frac{x^3 + 1}{x^2 + 2x}$.

(f) Resolve into partial fractions, $\frac{2x + 3}{x^2 (x - 1)}$

3. Attempt any FOUR of the following : **16**

(a) Solve the following equations, by using matrix intersection method :

$x + 3y + 2z = 6$, $3x - 2y + 5z = 5$, $2x - 3y + 6z = 7$

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

(c) Resolve into partial fractions, $\frac{e^x + 1}{(e^x + 2)(e^x + 3)}$

(d) Prove that $\sin(\pi + \theta) = -\sin\theta$

(e) Find value of $\frac{\sec^2 135°}{\cos(-240°) - 2\sin(930°)}$

(f) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$

4. Attempt any FOUR of the following : **16**

(a) Prove that, $\cos(A + B) = \cos A \cos B - \sin A \sin B$.

(b) Prove that $\tan A \cdot \tan(60° - A) \cdot \tan(60° + A) = \tan 3A$.

(c) By using principal value, prove that

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

(d) Prove that, (without using calculator) $\sin 20° \cdot \sin 40° \cdot \sin 60° \cdot \sin 80° = 3/16$

(e) Prove that, $\cos C - \cos D = -2\sin\left(\frac{C + D}{2}\right)\sin\left(\frac{C - D}{2}\right)$

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

5. Attempt any FOUR of the following : **16**

(a) Prove that, $\frac{\sec 4\theta - 1}{\sec 2\theta - 1} = \frac{\tan 4\theta}{\tan\theta}$

(b) Prove that, $\frac{\sin\theta - \sin 5\theta + \sin 9\theta - \sin 3\theta}{\cos\theta - \cos 5\theta - \cos 9\theta + \cos 13\theta} = \cot 4\theta$.

(c) Prove that, $\sin^{-1}x = \cot^{-1}\left(\frac{\sqrt{1 - x^2}}{x}\right)$.

(d) Prove that distance between two parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is $\left|\frac{c_1 - c_2}{\sqrt{A^2 + B^2}}\right|$

(e) Find equation of lines passing through (12, – 4) and whose sum of the intercepts is equal to 10.

(f) If m_1 and m_2 are the slopes of the lines, then prove that the angle between the two lines is $\theta = \tan^{-1} \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$.

6. Attempt any FOUR of the following : 16

(a) Prove that the length of perpendicular from the point $p(x_1, y_1)$ to the line $Ax + By + C = 0$ is $\left| \frac{Ax_1 + By_1 + C}{\sqrt{A^2 + B^2}} \right|$

(b) Find the length of the perpendicular from the point (2, 3) on the line $4x - 6y - 3 = 0$.

(c) Calculate the mean deviation from mean for the following data :

Marks :	3	4	5	6	7	8
No. of student :	1	3	7	5	2	2

(d) Find the standard deviation of the following :

Class :	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency :	20	130	220	70	60

(e) Find variance from the following series :

Age under :	10	20	30	40	50	60	70	80
No. of person :	15	30	53	75	100	110	115	125

(f) The mean and variance of 5 items are 64 and 68 respectively. If two more items of values 62 and 66 are added to the data, find the new variance of 7 items.