17104

11819

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) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Solve any TEN of the following: **20**

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

b) If $A = \begin{bmatrix} 3 & -1 \\ 0 & 4 \end{bmatrix}$ find the matrix B such that $2A + B = 0$

c) If $A = \begin{bmatrix} 3 & 4 & -2 \\ 2 & 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -1 \\ 3 & 4 \\ -0 & 2 \end{bmatrix}$ find AB.

d) Resolve into partial fraction $\dfrac{x}{x^2 - x - 2}$

e) Define compound angle.

f) Prove that $\tan\left(\dfrac{\pi}{4} - \theta\right) = \dfrac{1 - \tan\theta}{1 + \tan\theta}$

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

P.T.O.

Marks

h) If $2\cos 70° \cdot \sin 50° = \sin A - \sin B$ find angle A and B.

i) Show that $2x + y + 3 = 0$ and $x - 2y - 1 = 0$ are perpendicular lines.

j) Find the equation of line passing through (4, –5) and having slope $-\frac{2}{3}$

k) Find the range and co-efficient of range of the following:

x_i	10	20	30	40	50
f_i	7	5	3	2	1

l) If the mean is 82.5, standard deviation is 7.2. Find co-efficient of variance.

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

a) Solve by using Cramer's Rule.

$x + y = 0$; $y + z = 2$; $x + z = 4$

b) If $A = \begin{bmatrix} 2 & -1 & 1 \\ -2 & 3 & -2 \\ -4 & 4 & -3 \end{bmatrix}$ find A^2

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

verify that A(B + C) = AB + BC

d) Express the matrix A as sum of symmetric and skew symmetric matrix of A

$$A = \begin{bmatrix} -1 & 7 & 1 \\ 2 & 3 & 4 \\ 5 & 0 & 5 \end{bmatrix}$$

e) Resolve into partial fraction $\frac{x^2}{x^4 + x^2 - 2}$

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

Marks

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

a) Find the inverse of the matrix using adjoint method.

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$

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

c) Resolve into partial fraction $\dfrac{(\tan\theta+1)}{(\tan\theta+2)(\tan\theta+3)}$

d) Prove that $\sin(A+B) = \sin A\cos B + \cos A\sin B$

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

f) Prove that $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$

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

a) Prove that $1 + \tan A \cdot \tan 2A = \sec 2A$

b) Prove that $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8A}}} = 2\cos A$

c) Without using calculator find the value of
$\sin 420° \cos 390° + \cos(-300°)\ \sin(330°)$

d) If $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$ find $\tan(A + B)$

e) Find the principal value of $\sin^{-1}\left(\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right) - \tan^{-1}(\infty)$

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. Solve any FOUR of the following: **16**

a) Prove that $\cos 20° \cdot \cos 40° \cdot \cos 60° \cdot \cos 80° = \frac{1}{16}$

b) Prove that
$\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left[\dfrac{x+y}{1-xy}\right]$ for $x > 0,\ y > 0,\ xy < 1$

c) Prove that $\dfrac{\sin 4\theta + \sin 2\theta}{1 + \cos 2\theta + \cos 4\theta} = \tan 2\theta$

Marks

d) Find the angle between two lines $y = 5x + 6$ and $y = x$

e) Prove that the distance between two parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is $\left|\frac{c_2 - c_1}{\sqrt{a^2 + b^2}}\right|$

f) Find equation of line passing through the point of intersection of the lines $2x + 3y = 13$, $5x - y = 7$ and perpendicular to the line $3x - y + 7 = 0$

6. Solve any FOUR of the following: **16**

a) If m_1 and m_2 are slopes of any two lines L_1 and L_2 then prove that angle between two lines L_1 and L_2 is

$\theta = \tan^{-1}\left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$

b) Find the equation of line passing through the point (6, 5) and parallel to the line having intercepts 2 and 4 on X any Y axis respectively.

c) Two sets of observation are given below.

Set-I	Set-II
$\overline{X} = 82.5$	$\overline{X} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

which set is more consistant.

d) Find the mean deviation from mean for the following data:

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70
No. of student	4	6	10	18	9	3

e) Find the standard deviation from following:

Class interval	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	3	5	9	15	20	16	10	2

f) Find the variance and co-efficient of variance for the following:

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