17104

21718

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) 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 x, if $\begin{vmatrix} x & 0 & 0 \\ 3 & -2 & 1 \\ -2 & -4 & 1 \end{vmatrix} = 0$

b) If $A = \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 5 \\ 1 & -3 \end{bmatrix}$, find $2A + B$.

c) If $A = \begin{bmatrix} 2 & 4 \\ -1 & -2 \end{bmatrix}$ show that A^2 is null matrix.

d) If $A = \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ 3 & 2 \end{bmatrix}$ verify that $AB \neq BA$

e) Resolve into partial fraction $\frac{x+4}{x(x+1)}$

P.T.O.

Marks

f) Define Allied angle.

g) Prove that $\sin 2\theta = 2 \sin\theta \cos\theta$

h) If $\sin 80° + \sin 50° = 2 \sin\alpha \cdot \cos\beta$, find α, β.

i) Prove that $\sin^{-1}(-x) = -\sin^{-1} x$

j) Evaluate $2 \cos 75° \cdot \cos 15°$ without using calculator.

k) Prove that the lines $3x - 2y + 6 = 0$ and $2x + 3y - 1 = 0$ are perpendicular to each other.

l) Find the coefficient of range of the following distribution.

120, 100, 130, 50, 150

2. Attempt any <u>FOUR</u> of the following: **16**

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

$3x + y + z = 4,\ 2x - 3y + z = 7,\ x + y + 3z = 6$

b) 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 that $(AB)^T = B^T A^T$

c) If $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$ prove that $A^2 = I$.

d) If $A = \begin{bmatrix} 2 & 4 & 4 \\ 4 & 2 & 4 \\ 4 & 4 & 2 \end{bmatrix}$, show that $A^2 - 8A$ is a scaler matrix.

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

f) Resolve into partial fraction $\dfrac{3x - 1}{(x - 4)(2x + 1)(x - 1)}$

Marks

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

a) Using matrix inversion method, solve the following equations.
$3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$

b) Resolve into partial fraction $\frac{x-2}{x^3+1}$

c) Resolve into partial fraction $\frac{x^4}{x^2-1}$

d) Prove that $\sin(A+B).\sin(A-B) = \cos^2 B - \cos^2 A$

e) Prove that $\tan 70^\circ - \tan 50^\circ - \tan 20^\circ = \tan 70^\circ . \tan 50^\circ . \tan 20^\circ$

f) Prove that $\tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) = \cot^{-1}\left(\frac{9}{2}\right)$

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

a) Prove that $\cos 2A = 2\cos^2 A - 1$

b) If $\tan(x+y) = \frac{3}{4}$ and $\tan(x-y) = \frac{8}{15}$ show that $\tan 2x = \frac{77}{36}$

c) In any ΔABC, prove that
$\tan A + \tan B + \tan C = \tan A . \tan B . \tan C$

d) Prove that

$$\frac{\cos 2A + 2\cos 4A + \cos 6A}{\cos A + 2\cos 3A + \cos 5A} = \cos A - \tan 3A . \sin A$$

e) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$
(without using calculator.)

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

Marks

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

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

b) Prove that $\frac{\sin x - \sin 5x + \sin 9x - \sin 13x}{\cos x - \cos 5x - \cos 9x + \cos 13x} = \cot 4x$

c) Prove that $\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ if $x > 0, y > 0$ and $xy < 1$.

d) Find the distance between two parallel lines $3x - y + 7 = 0$ and $3x - y + 16 = 0$.

e) Find the acute angle between the lines $3x - 4y = 420$ and $4x + 3y = 420$.

f) Find the equation of a line passing through (2, 5) and the point of intersection of $x + y = 0$ and $2x - y = 9$.

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

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

b) Find the equation of a line passing through the point of intersection of lines $x - 2y - 5 = 0$ and $x + 3y = 10$ and parallel to the line $3x + 4y = 0$.

c) The runs scored by two batsmen A and B in 5 one day matches are given below.

A	48	50	39	46	37
B	50	52	60	55	53

Who is more consistent? Why?

Marks

d) Calculate mean and standard deviation of the 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 mean of the following distribution.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
No. of students	5	8	15	16	06

f) Find variance and the coefficient of variance for the following distribution.

Class-Interval	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	4	6	10	18	9	3