17104

21415

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 x if $\begin{vmatrix} 4 & 3 & 9 \\ 3 & -2 & 7 \\ 11 & 4 & x \end{vmatrix} = 0$.

b) Prove that the matrix $\begin{bmatrix} 1 & 4 \\ 6 & 9 \end{bmatrix}$, is a nonsingular matrix.

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 fractions $\frac{1}{x^3 - x}$.

e) Define compound angle.

f) Prove that $\sin(\pi/2 + \theta) = \cos\theta$.

g) Express : $4\cos 30^\circ \cdot \sin 20^\circ$ as the sum or difference of trigonometric ratios.

h) Find the principal value of, $\cos\left(\pi/2 - \sin^{-1}\frac{1}{2}\right)$.

P.T.O.

MARKS

i) Show that the lines $5x + 6y - 1 = 0$ and $6x - 5y + 3 = 0$ are perpendicular lines.

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

k) Find range and coefficient of range of the following distribution :

xi :	10	20	30	40	50
fi :	7	5	3	2	1

l) If mean is 82.5, standard deviation is 7.2, find coefficient of variance.

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

a) Solve the following equations by using, Crammer's rule :

$x + y = 4 - z,\ y + z = 1 - 2x,\ x + z = y.$

b) Find matrix X such that $\begin{bmatrix} 4 & 5 \\ -3 & 6 \end{bmatrix} + X = \begin{bmatrix} 10 & -1 \\ 0 & -6 \end{bmatrix}$.

c) If $A = \begin{bmatrix} 1 & -2 \\ -3 & -1 \end{bmatrix}, B = \begin{bmatrix} 4 & 2 & -5 \\ 1 & 0 & 3 \end{bmatrix}, C = \begin{bmatrix} 6 & -7 & 0 \\ -1 & 2 & 5 \\ 1 & 0 & 3 \end{bmatrix}$, prove that

$(AB)C = A(BC)$

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

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

e) Resolve into partial fractions $\frac{x+5}{x^2 - x}$.

f) Resolve into partial fractions $\frac{x^2 + 36x + 6}{(x-1)(x^2+2)}$.

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

a) Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 4 \\ -1 & 2 & 3 \\ 1 & 4 & 1 \end{bmatrix}$ using adjoint method.

MARKS

b) Solve by matrix method the following equations using inverse method
$3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$.

c) Resolve into partial fractions $\frac{x^3+1}{x^2+6x}$.

d) Resolve into partial fractions $\frac{(\tan\theta+1)}{(\tan\theta+2)\ (\tan\theta+3)}$.

e) If $\cos A = \frac{-3}{5}$, $\sin B = \frac{20}{29}$, where A and B are the angles in the third and second quadrant respectively. Find tan (A + B).

f) Without using calculator find the value of
$\sin(150°) - \tan(315°) + \cos(300°) + \sec^2(360°)$.

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

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

b) Prove that, $\sin(A-B) = \sin A \cdot \cos B - \cos A \cdot \sin B$.

c) If A and B both are obtuse angles and $\sin A = \frac{5}{13}$, $\cos B = \frac{-4}{5}$ then find the quadrant of angle A + B.

d) Prove that : $\frac{\sin 8x - \sin 5x}{\cos 7x + \cos 6x} = \sin x + \cos x \cdot \tan x/2$.

e) Prove that : $2\tan^{-1} x = \tan^{-1}\left[\frac{2x}{1-x^2}\right]$.

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

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

a) Prove that $\frac{\sin 4\theta + \sin 2\theta}{1+\cos 2\theta + \cos 4\theta} = \tan 2\theta$.

b) Prove that $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$.

MARKS

c) Prove that $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left[\frac{x+y}{1-xy}\right]$.

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

e) If $P(x_1, y_1)$ is any point and Ax + By + C = 0 is a line, then prove that the perpendicular distance of a point P from line is given by $\left|\frac{Ax_1 + By_1 + C}{\sqrt{A^2 + B^2}}\right|$

f) Find the 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. Attempt **any four** of the following : **16**

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

b) Find the acute angle between the lines 3x – 2y + 4 = 0, 2x – 3y – 7 = 0.

c) The two sets of observations are given below :

Set I	**Set II**
$\bar{x} = 82.5$	$\bar{x} = 98.75$
$\sigma = 7.3$	$\sigma = 8.35$

Which of the two sets is more consistent ?

d) Find variance and coefficient for the following data :

Class-intervals :	55 – 65	65 – 75	75 – 85	85 – 95	95 – 105	105 – 115	115 – 125
No. of workers :	10	12	15	20	14	7	2

e) Calculate Standard deviation of the following table :

Weekly Expenditure below :	05	10	15	20	25
No. of Students :	06	16	28	38	46

f) Calculate mean deviation about mean of the following distribution :

xi :	3	4	5	6	7	8
fi :	4	9	10	8	6	3
