17105

21819

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Figures to the right indicate full marks.

(3) Assume suitable data, if necessary.

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

(5) 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) Solve $\begin{vmatrix} 2 & 3 & x \\ 1 & 0 & 3 \\ -2 & -1 & 0 \end{vmatrix} = \begin{vmatrix} -1 & 8 \\ 2 & 1 \end{vmatrix}$

b) If $2\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ -8 \end{bmatrix}$, find x and y.

c) If $A = \begin{bmatrix} 3 & 2 \\ 1 & -1 \\ 0 & 4 \end{bmatrix}$, $B = \begin{bmatrix} -1 & -1 \\ 3 & 2 \\ 4 & -2 \end{bmatrix}$, Verify that $A + B = B + A$

d) If $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ show that AB is non-singular.

e) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 1 & -1 \end{bmatrix}$ find $3A - B + I$.

(Where I is identity matrix)

Marks

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

g) Prove that $[\sin\alpha \cdot \cos[\beta-\alpha]+\cos\alpha \sin(\beta-\alpha)]=\sin\beta$

h) If cosA = 0.4, Find cos3A.

i) If 2sin40°cos10° = sinA + sinB, Find A and B.

j) Find the principal value of $\sin^{-1}\left(\frac{-1}{\sqrt{2}}\right)$

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

l) Find the intercepts of the line $2x+3y=6$ on both axis.

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

a) Solve by Cramer's rule

$x+y+z=3, x-y+z=1, x+y-2z=0$

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

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

A (B + C) = AB + AC.

d) If $A=\begin{bmatrix}2 & 7\\ 1 & 0\end{bmatrix}$, find $A^2 - 6A + 8I$ Where I is unit matrix

e) If $\left\{3\begin{bmatrix}3 & 1\\ 4 & 0\\ 3 & -3\end{bmatrix}-2\begin{bmatrix}0 & 2\\ -2 & 3\\ -5 & 4\end{bmatrix}\right\}\begin{bmatrix}-1\\ 2\end{bmatrix}=\begin{bmatrix}x\\ y\\ z\end{bmatrix}$ Find x, y, z.

f) Resolve into partial fractions

$\frac{13x+19}{(x+1)(x-2)(x+3)}$

Marks

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

a) Find the adjoint of matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$

b) Using matrix inversion method solve the equations

$x + 3y + 3z = 12$

$x + 4y + 4z = 15$

$x + 3y + 4z = 13$

c) If $A = \begin{bmatrix} 3 & 4 \\ -2 & 1 \\ 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} -1 \\ 3 \end{bmatrix}$ verify that $(AB)^T = B^T \cdot A^T$

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

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

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

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

a) If $A + B = \frac{\pi}{4}$, show that $(1 + \tan A)(1 + \tan B) = z$

b) If $\tan(x+y) = \frac{3}{4}$ and $\tan(x-y) = \frac{1}{3}$ find

$\tan 2x$ and $\tan 2y$.

c) Without using calculator prove that

$\sin 420° - \cos 390° + \cos(-300°)\sin(-330°) = 1$.

d) Prove that $\frac{\cos 2A + 2\cos 4A + \cos 6A}{\cos A + 2\cos 3A + \cos 5A} = \cos A - \sin A \tan 3A$

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

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

Marks

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

a) Prove that $\sqrt{2+\sqrt{2+2\cos 4\theta}} = 2\cos\theta$

b) Prove that $\sin A \cdot \sin(60^\circ - A) \cdot \sin(60^\circ + A) = \frac{1}{4}\sin 3A$

c) Prove that $\frac{\cos 3A - 2\cos 5A + \cos 7A}{\cos A - 2\cos 3A + \cos 5A} = \cos 2A - \sin 2A \tan 3A$

d) Prove that $\frac{\sin 19^\circ + \cos 11^\circ}{\cos 19^\circ - \sin 11^\circ} = \sqrt{3}$

e) Prove that $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$

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

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

a) Find the angle between the lines

$2x + 3y = 13$ and $2x - 5y = 7$

b) Find the equation of the line passing through (1, 2) and point of intersection of two lines $2x + y - 1 = 0$ and $x - y = 14$.

c) Find the length of perpendicular from $(-3, -4)$ on line

$4(x + 2) = 3(y - 4)$.

d) Find the perpendicular distance between

$3x + 4y + 5 = 0$, and $6x + 8y = 25$.

e) If m_1 and m_2 are slopes of two lines, prove that the acute angle

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

f) Find equation of line making equal positive intercept on coordinates axis and passing through the point $(-2, 7)$.