North South University (NSU) Sec-11

Department of Department of Mathematics and Physics Time: 1 hour

Mid-Examination Course Code: MAT **125** Total Marks-20

Answer any (Four)

1. Write the augmented matrix, Solve the following system of linear equation by Gauss elimination and hence Gauss Jordan elimination method. **[5]**

$$2x_1 + 3x_2 + 5x_3 + x_4 = 3$$
$$3x_1 + 4x_2 + 2x_3 + 3x_4 = -2$$
$$x_1 + 2x_2 + 8x_3 - x_4 = 8$$
$$7x_1 + 9x_2 + x_3 + 8x_4 = 0$$

2 (a)Solve by Cramer's rule: **[2.5]**

$$2x - y + 2z = 2$$
$$x + 10y - 3z = 5$$
$$-x + y + z = -3$$

(b) Evaluate det (*A*) and adjoint of the matrix $A = \begin{bmatrix} 2 & 5 & 5 \\ -1 & -1 & 0 \\ 2 & 4 & 3 \end{bmatrix}$. Hence find the inverse of the Matrix. **[2.5]**

3.(a). Find the inverse of the Matrix $A = \begin{bmatrix} 2 & -4 & 0 & 0 \\ 1 & 2 & 12 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & -1 & -4 & -5 \end{bmatrix}$. **[3]**

(b) Let $P_1(2,2,0), P_2(-1,0,2),$ *and* $P_3(0,4,3)$, compute

$$\mathbf{x}\ if\ \mathbf{x} + (\mathbf{P_2P_1}).(\mathbf{P_3P_1}) = (\mathbf{P_1P_3}).(\mathbf{P_1P_2}).$$ **[2]**

4(a)Using matrices

$$A = \begin{bmatrix} 2 & 5 & 5 \\ -1 & -1 & 0 \\ 2 & 4 & 3 \end{bmatrix},\ B = \begin{bmatrix} 1 & 2 & 4 \\ -3 & 4 & 5 \\ 0 & 3 & 2 \end{bmatrix} \text{ and } C = \begin{bmatrix} 6 & 1 & 3 \\ -1 & 1 & 2 \\ 4 & 1 & 3 \end{bmatrix} \text{ compute } Tr\left(B^T C^T - 2A^T\right)$$ **[2.5]**

(b)Use the matrices $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 4 & 4 \end{bmatrix}$ to verify that $(AB)^{-1} = B^{-1}A^{-1}$. **[2.5]**

5(a) $T(x, y, z) = (x, y^3, -\sqrt{z})$, verify whether T is a linear transformation or not. **[2.5]**

(b) Find the scalars a, b, c such that

$$\mathbf{u} = (-2,9,6), \mathbf{v} = (-3,2,1), \mathbf{w} = (1,7,5)\ \&\ \mathbf{s} = (0,5,4)$$
$$and \quad a\mathbf{u} + b\mathbf{v} + c\mathbf{w} = \mathbf{s}.$$ **[2.5]**