North South University (NSU) Sec-11

Department of Department of Mathematics and Physics Time: 1 hour

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

ANSWER ANY FOUR

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1. **(a)** Find the rank and nullity of th4e following system of linear equations:

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

(5)

2. Show that the vectors $(1,1,0),(1,0,1)$ *and* $(0,1,1)$ form a basis or not for $\Re^3$ **(5)**

3. **(a)** Define subspace and Verify whether is subspace or not:

$$W = \{(x,y,z) : x,y,z \in \Re^3 \text{ and } x + y = 3z\}$$

(b) Let u, v and w are independent vectors, show that u+v, u-v and u-2v+w are independent

4. Define eigen values and eigen vectors. Compute eigen values and corresponding eigen vectors of

$A = \begin{bmatrix} 3 & 3 \\ 1 & 5 \end{bmatrix}$. Verify A^{-5} is diagonalizable or not.

5. **(a)** Find the equation of the circle passing through the points (2, -2), (3, 5) and (-4, 6). Also find it center and radius.

(b) Solve the linear program by graphical method:

$$\text{Maximize}, Z = x_1 + 2x_2$$
$$\text{Subject to}:$$
$$2x_1 + x_2 \le 4$$
$$x_1 + x_2 \ge 1$$
$$x_2 \le 5$$
$$x_1 \le 4$$
$$x_1, x_2 \ge 0.$$