University of Balochistan, Quetta

Subject: Linear Algebra **Semester:** Third **Program:** BS (IT Morning) **Date:** /12/2022

Exam: Final-Term **Session:** 2021-25 **Total Marks:** 70 **Time:** 90Minutes

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Question #1 :(a): Fill in the blanks. Marks (1×8)

I. Let A be a square matrix then det (A^T) = ------- det A -------

II. The inverse of a matrix $A=\begin{bmatrix} 7 & 5 & 2 \\ 3 & 6 & 4 \\ 3 & 6 & 4 \end{bmatrix}$ is ------- zero -------

III. The cofactor of entry a_{23} of matrix A of order 4×4 is ---------------------

IV. The cofactor of entry a_{33} of matrix A of order 4×4 is ---------------------

V. The inverse of a matrix exist if and only if --- The determinant is not equal to zero

VI. The general form of echelon form of matrix of order 4×4 is---------------------

VII. The l_2-norm of a vector $x=(7, 11, 5)^t$ is ---------------------

VIII. The l_∞-norm off a vector $x=(x_1, x_2, \text{-----}, x_n)^t$ is defined as ---------------------

(b) : Define the following terms with examples. Marks (5×2)

Echelon form of matrix, Cramer's Rule, l_∞-norm, coefficients matrix,

(c) : Write down the properties of determinant with examples. Marks (1×12)

Question#2.Solve the given system by using method of Gaussian elimination and Gaussian-Jorden elimination? Marks (2×8)

$$x_1 + x_2 + 2x_3 = 8$$
$$-x_1 - 2x_2 + 3x_3 = 1$$
$$3x_1 - 7x_2 + 4x_3 = 10.$$

Question#3(a). Solve the following system of equations using Cramer's rule? Marks (2×6)

a): $x + 2z = 6$, $-3x + 4y + 6z = 30$, $-x - 2y + 3z = 8$

b): $7x_1 - 2x_2 = 3$, $3x_1 + x_2 = 5$

Question#4. Find the inverse of the following matrices by using cofactor? Marks (2×6)

$$A=\begin{bmatrix} 3 & 1 & -4 \\ 2 & 5 & 6 \\ 1 & 4 & 8 \end{bmatrix}, B=\begin{bmatrix} 3 & 1 & 0 \\ -2 & -4 & 3 \\ 5 & 4 & -2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 2 \\ -3 & 4 & 6 \\ -1 & -2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 30 \\ 8 \end{bmatrix}$$

$$x = \frac{|A_1|}{|A|} = \frac{40}{44} = \frac{20}{22}$$

$|A| = 1(12+12) - 0(-9+6) + 2(6+4)$

$|A| = 1(24) + 0 + 2(10)$

$|A| = 24 + 20$

$|A| = 44$

$|A_1| \begin{bmatrix} 6 & 0 & 2 \\ 30 & 4 & 6 \\ 8 & -2 & 3 \end{bmatrix}$

$|A_1| = 6(12+12) - 0(90-48) + 2(-60-32)$

$= 6(24) - 0 + 2(-92)$

92 × 2 = 184, 184 − 144 = 40

5 + 12 + 16 + 8 + 8 = 49, 49 + 15 = 64