

Linear Algebra (MT1004)

Date: September 21st 2024

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BSE-3A

Section

Sessional-I Exam

Total Time (Hrs): 1 Hour

Total Marks: 40

Total Questions: 1

Ansley

Student Signature

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Attempt all the questions.

CLO #1: Use concept of elementary row operations to find the inverse of square matrices, determinant of a matrix and solving the system of linear equations.

Q#1. (a): Consider the following system in unknowns x , y and z . For what value(s) of "a, b" does the following system have no solution? Unique solution? Infinitely many solutions? [10 marks]

$$\begin{aligned} x - 2y &= 1 \\ x - y + az &= 2 \\ ay + 9z &= b \end{aligned}$$

b): Use Inversion Algorithm to find the inverse of $A = \begin{bmatrix} 1 & 4 \\ 3 & 5 \end{bmatrix}$. Also write down A^{-1} as a product of elementary matrices $A^{-1} = E_k E_{k-1} \dots E_3 E_2 E_1$. [10 marks]

c): Evaluate the given determinant by using row reduction method. [5 marks]

$$\left| \begin{array}{cccc} 2 & -1 & 5 & 5 \\ 3 & 1 & 2 & 4 \\ -1 & -3 & 8 & 0 \\ 1 & 1 & 2 & -1 \end{array} \right|$$

[3 marks]

d): Find the values of α for which $\det A = 0$.

$$|A| = \begin{vmatrix} \alpha - 4 & 0 & 0 \\ 0 & \alpha & 2 \\ 0 & 3 & \alpha - 1 \end{vmatrix} = 0$$

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e): Identify the row operation corresponding to E and verify that the product EM results from applying the row operation to M , where E is an elementary matrix. [2 marks]

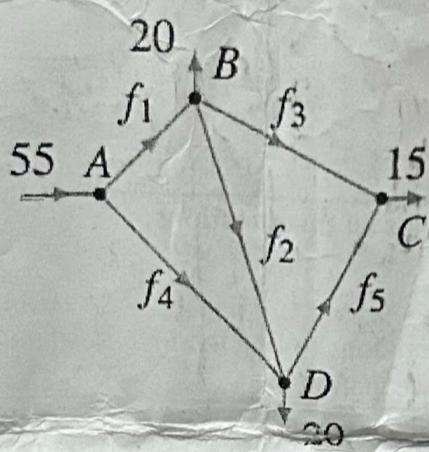
$$E = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

3×3

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

3×5

f): A proposed network of irrigation canals is described in the accompanying diagram. At peak demand, the flows at interchanges A, B, C, and D are as shown. [10 marks]



Set up a linear system whose solution provides the unknown flow rates and also solve the system for the unknown flow rates using Gauss Jorden elimination method.

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