2412E1123

Candidate's Seat No :_____

MSc IT DMVI (NEP) Sem-3 Examination

MDC-DMVI-234T

Mathematical Foundation of Computer Science

Time : 1-00 Hour] **December-2024** **[Max. Marks : 25**

Instructions:

- **Figures to the right indicate Full Marks.**
- **Do not write anything on the question paper.**
- **Simple calculator is allowed. Do not use a scientific calculator.**

Marks

Q-1 Choose the correct option. [05]

(1) Which gate is known as the universal gate? [01]

(a) AND (b) OR

(c) XOR (d) NOR

(2) Which of the following combinations produces a NAND gate? [01]

(a) AND + NOT (b) OR + NOT

(c) XOR + NOT (d) NOR + NOT

(3) For a 2×2 matrix A, the Cayley-Hamilton theorem implies? [01]

(a) $A^2 - (TR(A)).A + (DET(A)).I = 0$ (b) $A^2 + DET(A).I = 0$

(c) A and B both (d) None of the above

(4) What is a square matrix? [01]

(a) A matrix with all elements equal

(b) A matrix with an equal number of rows and columns

(c) A matrix with all diagonal elements zero

(d) A matrix with unequal rows and columns

(5) Matrix which satisfies the condition $A = A^T$ is called? [01]

(a) Null matrix (b) Identity matrix

(c) Symmetric matrix (d) Row matrix

Q-2 Answer the following question. [06]

(1) Find multiplication of determinant of matrix A and matrix B: [02]

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 6 & -3 & 4 \\ 2 & -3 & 7 \end{bmatrix}$$

$$B = \begin{bmatrix} 3 & 2 & 7 \\ 4 & -2 & 4 \\ 0 & 7 & 6 \end{bmatrix}$$

(2) Find value of system of linear equation by guess elimination method: [02]

$x + 2y + 4z = 8$

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

$3x + 2y + 6z = 15$

(3) Find algebraic multiplicity (AM) and geometric multiplicity (GM) of given matrix: [02]

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 3 & 7 & 1 \end{bmatrix}$$

Q-3 Answer the following question:(any three) [09]

(1) Find inverse of matrix by row elementary method: [03]

$$A = \begin{bmatrix} -2 & 1 & 3 \\ 0 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix}$$

(2) Find value of system of linear equation by guess Jordan method: [03]

$x + y + z = 9$
$2x - 3y + 4z = 13$
$3x + 4y + 5z = 40$

(3) Find value of system of linear equation by Cramer's rule: [03]

$x + 3y + 4z = 4$
$-x + 3y + 2z = 2$
$3x + 9y + 6z = -6$

(4) Find inverse of matrix by adjoint method: [03]

$$A = \begin{bmatrix} 6 & -2 & 1 \\ -4 & 1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$$

Q-4 Answer the following question: [05]

(1) Find value of system of linear equation by L-U decomposition method: [05]

$x + 5y + z = 14$
$2x + y + 3z = 13$
$3x + y + 4z = 17$

OR

(1) Find value of system of linear equation by L-U decomposition method: [05]

$x + y + z = 1$
$4x + 3y - z = 6$
$3x + 5y + 3z = 4$