(ii) Define Boolean Algebra. Write down the axioms of Boolean algebra. 5 (CO2)

OR

(b) Complete the following expressions by applying De-Morgan's Theorem : 10 (CO2)

(i) $((A' + C).(B + D'))'$

(ii) $(A' + A'B)'$

(iii) $((A + B') C)'$

H Roll No. .....

TBC–206/TBI–206

B.C. A./B. SC. (IT)

(SECOND SEMESTER)

MID SEMESTER

EXAMINATION, April, 2023

DISCRETE MATHEMATICAL STRUCTURE AND GRAPH THEORY

Time : 1½ Hours

Maximum Marks : 50

Note : (i) Answer all the questions by choosing any ***one*** of the sub-questions.

(ii) Each sub-question carries 10 marks.

1. (a) Show that every square matrix is uniquely expressible as the sum of a square matrix and a skew-symmetric matrix. 10 (CO1)

P. T. O.

OR

(b) Find the inverse of matrix

$$A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}.$$ 10 (CO1)

2. (a) The matrix A is defined as

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 3 & 2 \\ 0 & 0 & -2 \end{bmatrix}.$$ Find the eigen value of

$3A^3 + 5A^2 - 6A + 2I$. 10 (CO1)

OR

(b) Solve the following equations : 10 (CO1)

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

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

$$3x - 4y - 5z = -13$$

3. (a) Define the following types of matrices with suitable examples : 10 (CO1)

(i) Row Matrix

(ii) Column Matrix

(iii) Scalar Matrix

(iv) Singular Matrix

(v) Diagonal Matrix

OR

(b) Show that the matrix :

$$A = \begin{bmatrix} \alpha + i\gamma & -\beta + i\delta \\ \beta + i\delta & \alpha - i\gamma \end{bmatrix}$$

is unitary matrix if $\alpha^2 + \beta^2 + \gamma^2 + \delta^2 = 1$. 10 (CO1)

4. (a) Simplify the Boolean expressions : 10 (CO2)

(i) C (B + C) (A + B + C)

(ii) XY + X′Z + YZ

(iii) A + B (A + B) + A (A′ + B)

OR

(b) Use Karnaugh map to simply the following : 10 (CO2)

(i) X = ABC′ + ABC

(ii) X = A′B′C′ + AB′C′

(iii) X = A′B′CD + A′B′CD′ + AB′CD′ + AB′CD′

5. (a) (i) State and prove De-Morgan's Theorem. 5 (CO2)