(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)

P. T. O.