H Roll No. .....

TBC–205/TBI–204

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

(SECOND SEMESTER)

END SEMESTER

EXAMINATION, July/August, 2022

DISCRETE MATHEMATICAL STRUCTURE AND GRAPH THEORY

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

P. T. O.

1. (a) Solve following system of linear equations : (CO1)

$$x + 2y + 3z = 4$$

$$x + 4y + 9z = 6$$

$$x + y + z = 3$$

(b) Find the characteristics equation and Eigen values of the matrix : (CO1)

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

(c) Prove that : (CO1)

$$\begin{vmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & \gamma\alpha & \alpha\beta \end{vmatrix} = (\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)$$

2. (a) Convert the Boolean function : (CO2)

$$f(x, y, z) = (x' + y + z').(x' + y + z)(x + y' + z)$$

in disjunctive normal form.

(b) Use Karnaugh map to simplify the following expression : (CO2)

(i) $X = A'B'CD + A'B'CD' + AB'C'D' + AB'CD'$

(ii) $X = A'BC'D' + ABC'D' + A'BCD' + ABCD'$

(c) Complement the following expression by applying De-Morgan's theorem : (CO2)

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

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

3. (a) Define the following with example :(CO3)

(i) Regular graph

(ii) Bipartite graph

(iii) Weighted graph

(iv) Isomorphic graph

(b) Write down Konigsberg bridge problem. (CO3)

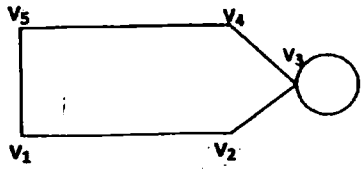
(c) From the given graph find the following : (CO3)

(i) degree and size of the graph

(ii) degree of each vertex

(iii) complement of graph

(iv) matrix for the graph

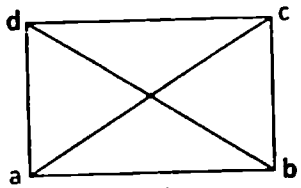


4. (a) Write short notes on the following : (CO4)

(i) Weakly and strongly connected graph

(ii) Indegree and outdegree for a directed graph

(b) Define planar graph and give the planar representation of the following graph. Find the region and its degree. (CO4)



(c) Define chromatic number and chromatic polynomial and find both these for the graph $K_{3,3}$. (CO4)

5. (a) Define the following with example : (CO5)

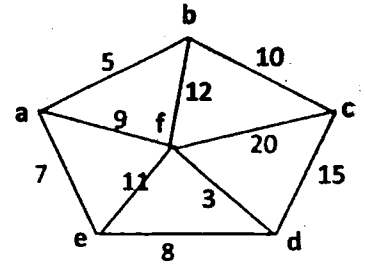
(i) Spanning tree

(ii) Branch and chord

(iii) Rank and nullity

(iv) Fundamental circuit

(b) Find the minimal spanning tree using Kruskal's algorithm. (CO5)



(c) How many spanning tree are possible for a complete graph with 4 vertices ? Give any *eight* of them. (CO5)