B.Tech (Fourth Semester Computer Science & Engineering (C.B.C.S))
End Semester Examination Summer – 2023
Course Name: Discrete Mathematics and Graph Theory

Course Code: **BCS2401**   DMT/EFV5734J/3082

Time: 3 Hours]   [Max.Marks: 60

Instructions to Candidates:
1. *All questions carry marks as indicated.*
2. *All the sub- questions (a, b, c, d, and e) ofQue.1 in Section A are compulsory.*
3. *Solve any two sub-questions in Que. 2 to Que.6 in Section B.*
4. *Assume suitable data wherever necessary.*
5. *Use of non-programmable calculator is permitted.*

Section – A

Que.1

    a) Prove that $A \cap A = A$.   2 (CO1)

    b) How many 7 letter words can be formed using the word 'Benzene'.   2 (CO2)

    c) Prove that in a distributive lattice if the complement exists then it is unique.   2 (CO3)

    d) Find the measure of fuzziness for the fuzzy set $A = \frac{0.2}{x1} + \frac{0.4}{x2}$.   2 (CO4)

    e) Design the algebraic expression using binary tree. Also draw the venn diagrams.   2 (CO5)

        i)   X*Y

        ii)   (a*b)/(c+d)

Section – B

Que.2

    a) Find the relation matrix and draw the graph for the relation   5 (CO1)

        R={(1,2) ,(2,3) ,(3,4),(2,1)},

        Also find the transitive closure of R.

    b) Prove that $A \cap (B-C) = (A \cap B) - (A \cap C)$.   5 (CO1)

    c) Prove by Mathematical induction that the sum of cube of three consecutive integers are divisible by 9.   5 (CO1)

Que.3

    a) Find the minimum number of students in a class to be sure that four out of them are born in the same month.   5 (CO2)

    b) Solve the recurrence relation   5 (CO2)

        $a_n = a_{n-1} + 2$,$n \geq 2$, $a_0 = 3$.

    c) Find the closed form of generating function for each of following   5 (CO2)

        Sequences

        A) 0,0,1,1,1,…

        B) 1,0,-1,0,1,0,-1,0,…

Que.4

    a) Prove that fourth roots of unity form a group under multiplication.   5 (CO3)

    b) Show that the lattice (S_n, D) n=30 is a complemented lattice.   5 (CO3)

c) Show that if R is a ring, for all a,b ∈ R then   5 (CO3)

    i) $a \cdot 0 = 0 = 0 \cdot a$

    ii) $a \cdot (-b) = (-a) \cdot b = -(a \cdot b)$.

    iii) $(-a) \cdot (-b) = a \cdot b$

Que.5

a) Find Bounded sum and Bounded Difference for the fuzzy sets $A = \frac{0.2}{x1} + \frac{0.5}{x2} + \frac{0.6}{x3}$ 5 (CO4)

and $B = \frac{0.1}{x1} + \frac{0.5}{x2} + \frac{0.6}{x3}$.

b) Illustrate the matrix and draw the respective graph for following, Let   5 (CO4)
A={a1,a2,a3} and B={b₁,b₂,b₃,b₄}. Let R be the relation from A to B is given

by $\frac{0.1}{(a1,b3)} + \frac{0.8}{(a1,b4)} + \frac{0.8}{(a2,b2)} + \frac{0.1}{(a3,b1)} + \frac{0.8}{(a3,b2)} + \frac{1}{(a3,b3)} + \frac{0.8}{(a3,b4)}$

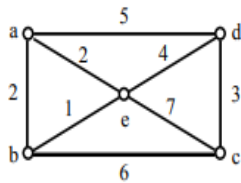**c)** Find fuzzy relation R=A×B , S=B×C if fuzzy sets   5 (CO4)

$A = \{\frac{0.3}{30} + \frac{0.7}{60} + \frac{1}{100}\}$, $B = \{\frac{0.2}{20} + \frac{0.4}{40} + \frac{0.6}{60}\}$ and $C = \{\frac{0.3}{50} + \frac{0.6}{100}\}$.

Que.6

a) Design a tree for the relation R={(1,2),(1,3),(1,4),(2,5),(4,6),(4,7)}on a set   5 (CO5)
A={1,2,3,4,5,6,7} . Also give the corresponding binary tree.

b) Find the minimal spanning tree of the following graph using Prim's algorithm   5 (CO5)

c) Find the node base of the following digraph.   5 (CO5)