END SEMESTER EXAMINATION : APRIL-MAY, 2024

DISCRETE MATHEMATICAL STRUCTURES

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five.**
Each question carries **06** *marks.*

1. Prove the consensus theorem which is given by (XY)+(YZ)+(X'Z)= XY+X'Z

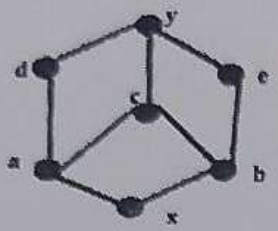
Also write down the duel of the above expression.

2. Prove that:

1. $\neg(p \leftrightarrow q) \equiv p \leftrightarrow \neg q \equiv \neg p \leftrightarrow q$
2. $\neg(p \rightarrow q) \equiv p \wedge \neg q$
3. $\neg(p \rightarrow \neg q) \equiv p \wedge \neg\neg q \equiv p \wedge q$.

P.T.O.

3. For the given lattice on set A= {x,a,b,c,d,e,y}, identify if the subset B= {x,a,y,b} and subset C= {x,a,y,c,b} are sublattices or not.



(6)

4. Given, E= xy' + xyz' + x'yz'

Find its prime implicants and essential prime implicants using Consensus Theorem

5. Explain Havel Hakimi Theorem. For the given degree sequence find if a simple graph exists or not?

(a) 7,6,5,4,4,3,2,1

(b) 6,6,6,6,3,3,2,2

(6)

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three**.
Each question carries **10** *marks.*

6. (a) Rewrite the following statements without using the conditional:

(a) If it is cold, he wears a hat.

(b) If productivity increases, then wages rise

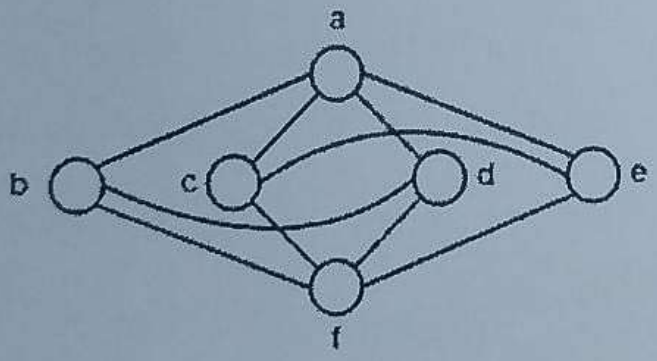
(2)

(b) Explain the closure property of a relation with suitable example.

Consider **A= {a, b, c, d} and R= {(a, a), (a, b), (b, c), (c, c)}**

Use Warshall's algorithm to find the transitive closure (8)

7. (a) What do you understand by graph colouring? What will be the chromatic number of a bi-partite graph? Find the chromatic number of the following graph.



(7)

(b) Write all the 3 cases to delete a node in a Binary search tree (BST). (3)

8. (a) Minimize f = m(1,5,6,12,13,14) + d(4) in SOP minimal form using a K map. (5)

P.T.O.

(b) Each student in Liberal Arts at some college has a mathematics requirement A and a science requirement B.

A poll of 140 students shows that: 60 completed A, 45 completed B, 20 completed both A and B. Use a Venn diagram to find the number of students who have completed:

(a) At least one of A or B;

(b) exactly one of A or B;

(c) neither A nor B. (5)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Based on your understaning, explain Homomorphism and isomorphism in groups.

Let $(\{0,2,4\} +_6)$ and $(\{0,4,16\}+_{17})$ are two groups, A mapping function fis defined by ***f: is square of***

Identify if it is homomorphic group or not. (8)

(b) Draw a Hasse diagram of [D30,/1. Find its maximal, minimal, Greatest Lower bound, and Least Upper Bound for B={6,10} and B'= {2, 15}. Also find the compliments of 2, 6 and 10. Identify if it is a Complemented lattice, Distributive Lattice and/or Boolean Algebra. (8)