



**2023/FYUG/ODD/SEM/
CADSC-102T/152**

**FYUG Odd Semester Exam., 2023
(Held in 2024)**

**COMPUTER APPLICATION
(1st Semester)**

Course No. : CADSC-102T

(Discrete Mathematics)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

SECTION—A

Answer *ten* questions, selecting *two* from each

Unit :

2×10=20

UNIT—I

1. Define compound proposition with example.
2. Define contrapositive and converse.
3. What is WFF? Give example.



(2)

UNIT—II

4. Define power set with example.
5. Define injective and bijective functions.
6. What is Hasse diagram? Give example.

UNIT—III

7. Define POSET with example.
8. Show that 1 is the only complement of 0.
9. What is duality principle? Give example.

UNIT—IV

10. Write down the properties of tree.
11. Define spanning tree with an example.
12. What do you mean by pendant vertices in a tree? Give example.



UNIT—V

- 13. Write down the application of graph theory. .81
- 14. Define isomorphic graph with example.
- 15. Write a short note on Eulerian graph.

SECTION—B

Answer *five* questions, selecting *one* from each
Unit : 10×5=50

UNIT—I

- 16. (a) Determine the validity of the following argument : 5
If I study, then I will pass.
If I do not go to a movie, then I will study.
I will fail.
Therefore, I went to a movie.
- (b) Obtain the truth table for 5
$$\alpha = (P \vee Q) \wedge (P \rightarrow Q) \wedge (Q \rightarrow P)$$
- 17. (a) Show that $P \rightarrow (Q \vee R)$ and $(P \rightarrow Q) \vee (P \rightarrow R)$ are logically equivalent (Using law of proposition). 5
- (b) Prove that the following argument is valid : 5

$$P \rightarrow \neg Q, R \rightarrow Q, R \vdash \neg P$$

(Turn Over)



UNIT—II

18. (a) (i) Prove that
 $A \cap (B - C) = (A \cap B) - (A \cap C)$ 3

(ii) Given

$$f(x) = 2x + 3 \text{ and}$$

$$g(x) = 3x + 2$$

Check if the commutative law holds good for the composition of functions. 4

- (b) Draw the Hasse diagram of D_{70} . 3

19. (a) In a group of 1000 people, there are 750 who can speak Hindi and 400 who can speak Bengali.
(i) How many can speak Bengali only?
(ii) How many can speak Hindi only?
(iii) How many can speak both? 3

(b) Given the relation

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

(i) Is R reflexive or transitive?

(ii) Is R antisymmetric?

(iii) Determine R^2 . 1+1+1=3

(c) Define Cartesian product. Prove that

$$(A \times B) \cup (A \times C) = A \times (B \cup C) \quad 1+3=4$$



UNIT—III

20. (a) In a Boolean algebra B , show that—

(i) $(a + b)' = a' * b'$

(ii) $(a * b)' = a' + b'$ $2^{1/2} + 2^{1/2} = 5$

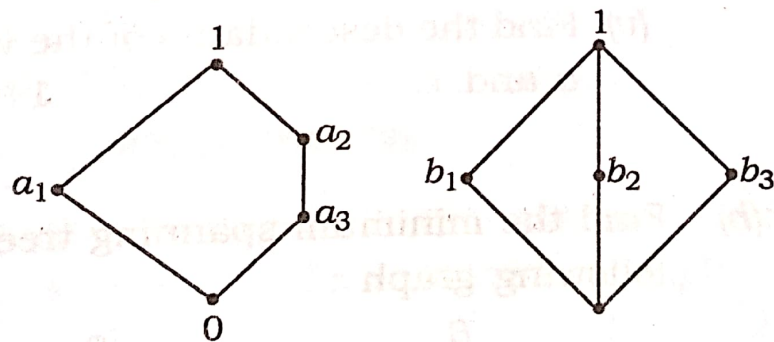
(b) Let a be any element of a Boolean algebra B . Show that—

(i) if $a + x = 1$, and $a * x = 0$, then $x = a'$;

(ii) $(a')' = a$;

(iii) $0' = 1$ and $1' = 0$. $2 + 1 + 2 = 5$

21. (a) Show that the lattices given by the following diagrams are not distributive : 4



(b) Show that every chain is a lattice. 2

(c) Express the following Boolean expression as a sum-of-products and then in its complete sum-of-products form : $2 + 2 = 4$

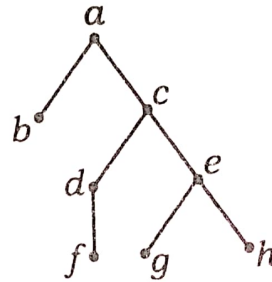
$$E(x, y, z) = x \cdot (xy' + x'y + y'z)$$



(6)

UNIT—IV

22. (a) Consider the following rooted tree :



(i) What is the root of T ?

(ii) Find the leaves and the internal vertices of T .

(iii) What are the levels of c and e ?

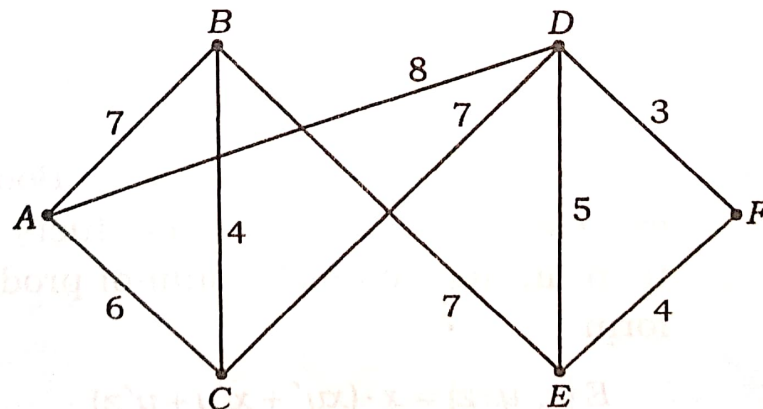
(iv) Find the children of c and e .

(v) Find the descendants of the vertices a and c .

$$1+1+1+1+1=5$$

(b) Find the minimum spanning tree of the following graph :

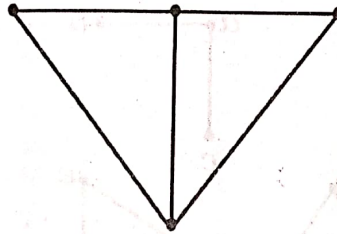
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(7)

23. (a) Find all spanning trees of the graph G shown below : 3



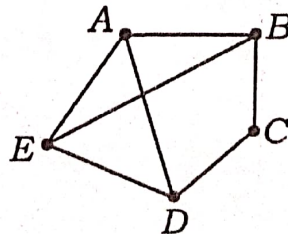
(b) Explain Prim's algorithm with example. 7

UNIT—V

24. (a) Write short notes on the following : $1\frac{1}{2} \times 4 = 6$

- (i) Degree of a vertex
- (ii) Subgraphs
- (iii) Bipartite graph
- (iv) Hamiltonian graph

(b) Find the adjacency matrix and adjacency list of the following graph : $2+2=4$



25. (a) What is complete graph? Draw the complete graph K_5 . $1+2=3$



(8)

(b) Which of the following graphs are connected? Justify. 2+2+2=6

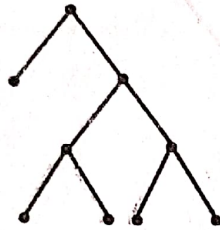


Fig (i)

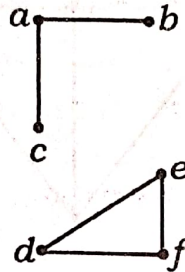


Fig (ii)

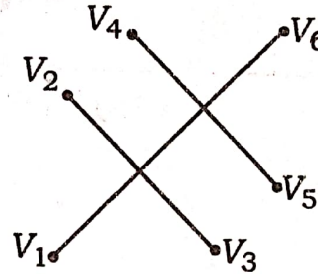


Fig (iii)

(c) Define path.

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