2024/FYUG/ODD/SEM/
CADSC-102T/302

FYUG Odd Semester Exam., 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

UNIT—I

1. Answer any *two* from the following : 2×2=4

(a) Define tautology and contradiction.

(b) Write the truth tables of 'conjunction' and 'disjunction'.

(c) What are universal and existential quantifiers?

2. *(a)* Determine the validity of the following arguments : 5

If I study, then I will not fail mathematics.

If I do not play basketball, then I will study.

But I failed mathematics.

Therefore, I must have played basketball.

(b) Show that

$$(P \Rightarrow Q) \wedge (R \Rightarrow Q) \equiv (P \vee R) \Rightarrow Q$$ 5

OR

3. *(a)* Obtain the disjunctive normal form of $(P \wedge \neg(Q \wedge R)) \vee (P \Rightarrow Q)$. 3

(b) Discuss the validity of the following arguments : 3

All graduates are educated.
Ram is graduate.
Therefore, Ram is educated.

(c) Using identities, prove that

$$Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$$

is a tautology. 4

UNIT—II

4. Answer any *two* from the following : 2×2=4

(a) Define surjective function. Give an example.

(b) What is composition of relation? Give an example.

(c) What is partially ordered set?

5. *(a)* Discuss about different types of relations with example. 6

(b) Let R and S be the relations on

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

Find $R \circ S$ and $S \circ S$. 4

OR

6. *(a)* For any two sets A and B, prove that

(i) $(A \cup B)' = A' \cap B'$

(ii) $(A \cap B)' = A' \cup B'$ 2+2=4

(b) In a class of 80 students, 50 students know English, 55 know French and 46 know German language. 37 students know English and French, 28 students know French and German, 7 students know none of the languages.

(i) Find how many students know all the three languages. 3

(ii) Find how many students know exactly two languages. 3

UNIT—III

7. Answer any *two* from the following : 2×2=4

(a) Define bounded and distributive lattice.

(b) What do you mean by prime implication?

(c) Define lattice.

8. *(a)* Convert the following expression into sum-of-product form : 5

$$E = ((xy)'z)'((x' + y)(y' + z')'$$

(b) Find the minimal sum-of-products for each of the following Boolean expressions : 2+3=5

(i) $E_1 = xy + x'y + x'y'$

(ii) $E_2 = xyz' + xy'z + x'yz + x'y'z$

OR

9. *(a)* Let $A = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24\}$ be ordered by the relation 'x divides y'. Draw the Hasse diagram of A. 5

(b) Define Boolean algebra. Show that the following statements are equivalent in a Boolean algebra : 2+3=5

(i) $a + b = b$

(ii) $a' + b = 1$

(iii) $a * b' = 0$

UNIT—IV

10. Answer any *two* from the following : 2×2=4

(a) What do you mean by complete binary tree? Explain with an example.

(b) Prove that the maximum number of vertices in a binary tree of height h is

$$2^{n+1} - 1, \quad h \geq 0$$

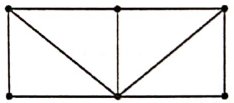
(c) What is minimum cost spanning tree?

11. *(a)* Explain the traversal of binary trees with example. 7

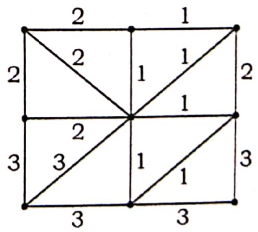
(b) Explain Kruskal algorithm for minimum spanning tree. 3

OR

12. *(a)* Find all spanning trees corresponding to the following graph : 4



(b) Find a minimal spanning tree of the following graph : 6



UNIT—V

13. Answer any *two* from the following : 2×2=4

(a) Define graph.

(b) What are multigraph and weighted graph?

(c) Write down the difference between Eulerian graph and Hamiltonian graph.

14. *(a)* Write short notes on the following : 3×2=6

(i) Regular graph

(ii) Eulerian graph

(iii) Planner graph

(b) Prove that the number of vertices of odd degree in a graph is always even. 4

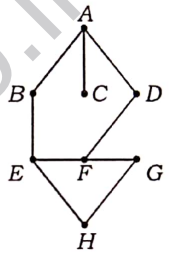
OR

15. *(a)* Draw the graph G for the following adjacency matrix : 3

$$A=\begin{bmatrix}0&1&0&1&0\\1&0&0&1&1\\0&0&0&1&1\\1&1&1&0&1\\0&1&1&1&0\end{bmatrix}$$

(b) Define walks, paths and circuit with diagram. 3

(c) Write the adjacency matrix and adjacency list of the following graph : 2+2=4



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