2024/FYUG/ODD/SEM/
CSCDSC-102T/135

FYUG Odd Semester Exam., 2024

COMPUTER SCIENCE

(1st Semester)

Course No. : CSCDSC-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 with an example.

(b) Rewrite the following statements without using the conditionals :

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

(ii) If productivity increases, then wage rises.

(c) Show that the propositions $\rceil(P \wedge q)$ and $\rceil P \vee \rceil q$ are logically equivalent.

2. Answer any *one* from the following : 10

(a) (i) Prove that the following argument is valid : 4

$$P \to \rceil q,\ r \to q,\ r \vdash \rceil q$$

(ii) Show that $\rceil(P \vee q) \vee (\rceil P \wedge q) \equiv \rceil P$ without using truth table. 3

(iii) Verify that the proposition $(P \wedge q) \wedge \rceil(P \vee q)$ contradiction. 3

(b) (i) Determine the validity of the following argument : 4

$$P \to q,\ \rceil q \vdash \rceil P$$

(ii) Define CNF and DNF with example. 4

(iii) Negate the following statement : 2

All the students completed their homework and the teacher is present.

UNIT—II

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

(a) Define power set with an example.

(b) Let R and S are two relations on a set

$A = \{1, 2, 3\}$

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

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

Find—

(i) $R \cap S$

(ii) R^C

(c) State pigeonhole principles.

4. Answer any *one* from the following : 10

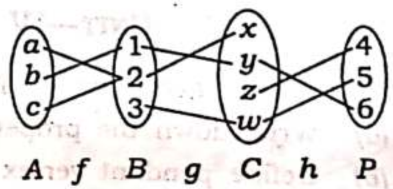
(a) (i) Consider Z be the set of integers and an integer $m > 1$. We say that x is congruent to y modulo m written as $x \equiv y (\text{mod}\, m)$ if $x - y$ is divisible by m. Show that the defined relation is an equivalence relation. 5

(ii) Let $f : R \to R$ be defined by $f(x) = 2x - 3$, if f is one to one and onto. Find the formula for f'. 3

(iii) Define compositon function with exmaple. 2

(b) (i) Discuss different types of relations with example. 6

(ii) Let the functions $f : A \to B$, $g : B \to C$ and $h : C \to D$ is defined as



Determine h.g.f. Also check it if each function onto or not. 4

Unit—III

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

(a) Define POSET with example.

(b) State and prove De Morgan's theorem.

(c) Simplify to a minimum number of literals

$$xy + x'z + yz$$

6. Answer any *one* from the following : 10

(a) (i) Let D_m denote the positive divisor of m ordered by divisibility. Draw the Hasse diagram for the following : 2½+2½=5

1. D_{12}
2. D_{16}

(ii) Write a short note on canonical forms. 5

(b) (i) Define lattice. Discuss the different types of lattices with example. 7

(ii) Prove that $(x+y)(x+z) = x + yz$. 3

Unit—IV

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

(a) Write down the properties of tree.

(b) Define pendant vertex with example.

(c) State the differences between rooted and unrooted binary tree.

8. Answer any *one* from the following : 10

(a) What do you mean by the treversing of a tree? Discuss different tree traversing techniques with an example.

(b) Define binary tree. How do you represent a binary tree in computer memory? Discuss with an example.

Unit—V

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

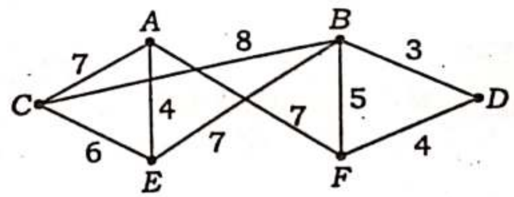
(a) Define multigraph with example.

(b) Can a simple graph exist with 15 vertices of degree 5? Justify.

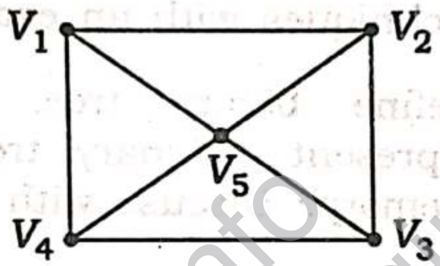
(c) What is bipartite graph? Give an example.

10. Answer any *one* from the following : 10

(a) (i) Find a minimal spanning tree of the following weighted graph G : 5



(ii) Explain graph colouring algorithm. Colour the following graph using graph colouring algorithm : 5



(b) *(i)* Show that the maximum number of edges in a simple graph with n vertives is $n(n-1)/2$. 3

(ii) Draw the graph $K_{2,5}$. 2

(iii) Discuss Prim's algorithm with example. 5

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