18P135 (Pages: 2) Name: …….

Reg. No……...

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(Regular/Supplementary/Improvement)

(CUCSS-PG)

CC17P CSS1 C01 - DISCRETE MATHEMATICAL STRUCTURES

(Computer Science)

(2017 Admission onwards)

Time: Three Hours Maximum: 36 Weightage

PART A

Answer ***all*** questions. Each question carries 1 weightage.

1. What are quantifiers?
2. Define finite set and infinite set with example.
3. State principle of inclusion and exclusion.
4. Show that the following statement is a tautology by using truth table.

   $p \vee (\sim q \wedge p)$
5. Find the inverse of the function $f(x)=\sqrt[3]{(x-2)}$
6. Define the composition of functions.
7. Let $A = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24\}$. Consider relation 'x divides y', is a partial order relation. Draw the Hasse diagram of the poset $(A, \leq)$
8. Define Lattice and give an example.
9. Define Abelian group with example.
10. What is an integral domain? Give an example.
11. Define Regular graph with example.
12. Draw Petersen graph.

(12 x 1 = 12 Weightage)

PART B

Answer any ***six*** questions. Each question carries 2 weightage.

13. Prove the validity of the following argument by truth table and rules of inference

    "If there was a traffic jam then travelling was difficult. If they arrived in time then travelling was not difficult. They arrived in time. Therefore, there was no traffic jam."
14. If A and B are any two sets, then prove that $A \cup B = A \cap B \iff A = B$
15. Explain closure of a relation with example.
16. Show that the relation $\leq$ (less than or equal to) defined on the set of positive integers, I_+ is a partial order relation.

17. Prove that the inverse of a is a^{-1}, then the inverse of a^{-1} is a.
18. Show that the set I of all integers {……, -3, -2, -1, 0, 1, 2, 3…….} is a group with respect to the operation of addition of integers.
19. Explain Bounded Lattice and Complemented Lattice with example.
20. Prove that number of vertices is one more than the number of edges in a tree.
21. Explain Kruskal's algorithm with example.

(6 x 2 = 12 Weightage)

PART C

Answer any ***three*** questions. Each question carries 4 weightage.

22. Using the truth tables, prove that following are equivalent:

$$(P \longrightarrow Q) \wedge (R \longrightarrow Q) \equiv (P \vee R) \longrightarrow Q$$

23. Using rules of inference prove that the following argument is valid.

"All human beings are mortal. If John is mortal then John is clever. But, it is not the case that John is a human being and John is clever. However, John is a human being or John is a robot. Therefore, John is a robot"

24. What you mean by Equivalence Relation?

Explain whether the following are equivalence relations or not.

a) xRy if $|x| = |y|$

b) xRy if $x - y \geq 0$

c) xRy if $x - y$ is a multiple of 2

25. Discuss Dijkstra's shortest path algorithm with example.
26. Discuss Königsberg Bridge problem. Prove that a finite connected graph G is Eulerian if and only if each vertex has even degree?
27. State and prove Lagrange's theorem.

(3 x 4 = 12 Weightage)

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