D 32684 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2022

(CBCSS)

Computer Science

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Part A

Answer any **four** *questions.*

Each question carries 2 *weightage.*

1. In general, when are two sets D, E such that $D \cap E = D \cup E$?
2. Construct the truth table $(P \to Q) \wedge (Q \to P)$.
3. If R = $\{(x, y) : x + 2y = 8\}$ is a relation on N, then write the range of R.
4. Show that $(A + B)(A + C) = A + BC$.
5. Define cyclic group with an example.
6. Give an example of a ring which is not a field.
7. Write about complete bipartite graph with example.

(4 × 2 = 8 weightage)

Part B

Answer any **four** *questions*

Each question carries 3 *weightage.*

8. Show that $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology
9. Write the rule of Modus tollens of predicates.
10. Define equivalence relation with the help of suitable example.
11. State and prove Lagrange's theorem on cosets.

Turn over

12. Let G be a finite group and let H and K be sub-groups with relatively prime order. Then $H \cap K = \{1\}$.

13. Define the following with suitable example : (a) Closed Walk and Open walk ; and (b) Trail.

14. Proof that a simple graph with n vertices and k components can have at most $(n - k)(n - k + 1)/2$ edges.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries 5 *weightage.*

15. Rewrite each proposition symbolically, given that the universe of discourse is a set of real numbers.

    (a) For each integer x, there exit an integer y such that $x + y = 0$.

    (b) There exist an integer x such that $x + y = y$ for every integer y.

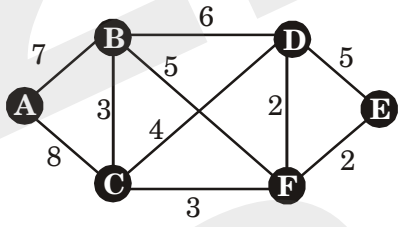
    (c) For all integers x and y, $x.y = y.x$.

    (d) There are integers x and y such that $x + y = 5$.

16. Discuss the difference between Injective, Surjective, and Bijective Functions with example.

17. Define homomorphism and isomorphism between two algebraic systems. Give example for both homomorphism and isomorphism of groups.

18. Explain Kruskal's algorithm and find the minimum spanning tree for the following graph :



(2 × 5 = 10 weightage)