D 13111 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Computer Science

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*
4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

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

1. Define Equal sets. Find whether $A = \{x : x \in N, 4 \leq x \leq 8\}$ and $B = \{4, 5, 6, 7, 8\}$ are equal sets ?
2. Let $f(x) = 6x^2 + 8x - 10$ and $g(x) = 2x + 5$ then find $f \circ g$ and $g \circ f$.
3. State Duality Principle. Using it prove $p \cup ((q \cup p) \cap q) = 1$.
4. Write a note on monoids with the help of an example.
5. Identify whether the following graph is bipartite or not. Give reasons to your answer.

6. State Principle of Inclusion and Exclusion.

7. Draw Hasse diagram for $(D_{12}, /)$ [Here, D_{12} means set of positive integers divisors of 12].

(4 × 2 = 8 weightage)

Section B

Answer any **four** *questions.*

Each question carries 3 weightage.

8. Discuss Propositional Logic. Find whether the given preposition is a tautology or contradiction.

$$S : ((P \wedge Q) \rightarrow R) \rightarrow ((P \wedge Q) \rightarrow (Q \rightarrow R)).$$

9. Let the relation $\{R(a, b) \mid |a+1| = |b+1|\}$ is on the set of integers Z. Find the equivalence classes for R.

10. Using an example differentiate complemented and distributive lattices and its properties.

11. State and proof Lagrange's Theorem.

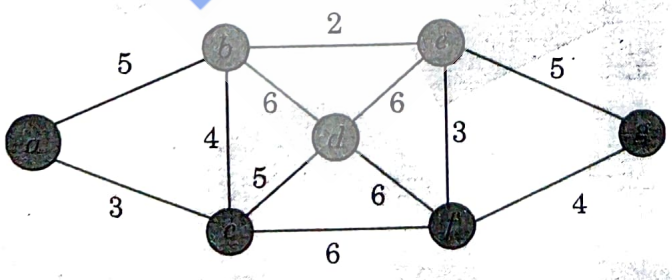
12. Explain Eulerian path and circuit. Sketch an Eulerian path and circuit for the given set of numbers {0, 1, 2, 3, 4}.

13. Write a note on Predicate logic. Write the predicate logic for the following :

(a) Everyone loves Jerry.

(b) If anyone cheats, everyone suffers.

14. Find how many distinct minimum spanning trees are possible for the following graph using Kruskal's algorithm :



(4 × 3 = 12 weightage)

Section C

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

15. Explain :

    (a) Well Formed Formulas and its associated rules .

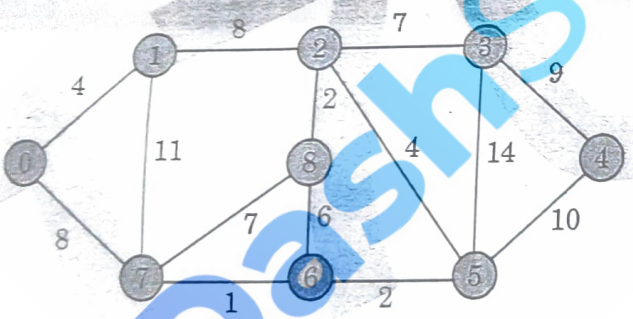
    (b) Free and Bound variables with examples.

16. (a) Given $h(x) = (1 + 2x) / (7 + x)$ then find $h^{-1}(x)$.

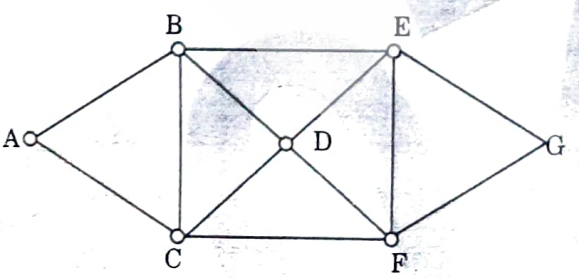
    (b) Let say S is the set of all people in world and R is the relation defined on a set S such that $(a, b) \in R$, where a and b are people, if a is taller than b then find whether (S,R) is a poset or not ?

17. Demonstrate homomorphism, Ring and Fields with examples.

18. (a) Find the shortest path from 0 to 4 for the given weighted graph using Dijkstra's algorithm.



(b) Does the following graph has a Hamiltonian path and circuit ? If so find one.



(2 × 5 = 10 weightage)