D 72941 (Pages : 3) Name..

Reg. No......................................

FIRST SEMESTER M.Sc. COMPUTER SCIENCE DEGREE EXAMINATION DECEMBER 2019

(CBCSS)

Computer Science

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer any **four** *questions.*

Each question carries 2 *weightage.*

1. State the rules for producing well formed formula. Give one example of WFF.

2. Translate the following statements into English:

   $(x): x$ is a cat
   $A(x): x$ is an animal

   (i) $\forall x\left((x) \rightarrow A(x)\right)$. (ii) $\forall x\left((x) \wedge A(x)\right)$.

   (iii) $\exists x\left((x) \rightarrow A(x)\right)$. iv) $(\forall x)\left((x) \wedge \sim A(x)\right)$.

3. What is a Hasse diagram ? Give example.

4. Explain principle of duality with suitable example.

5. Define function and composition of functions. List types of functions.

6. Define subgroups and Cosets. Give examples.

7. Define Bipartite Graph. Give example.

(4 × 2 = 8 weightage)

Turn over

Section B

Answer any **four** *questions.*
Each question carries 3 weightage.

8. State the rules of inference. State modus ponens and prove that it is a tautology.

9. Let A, B, C be arbitrary sets. Show that :

   (i) $(A-B)-C = A-(B \cup C)$.

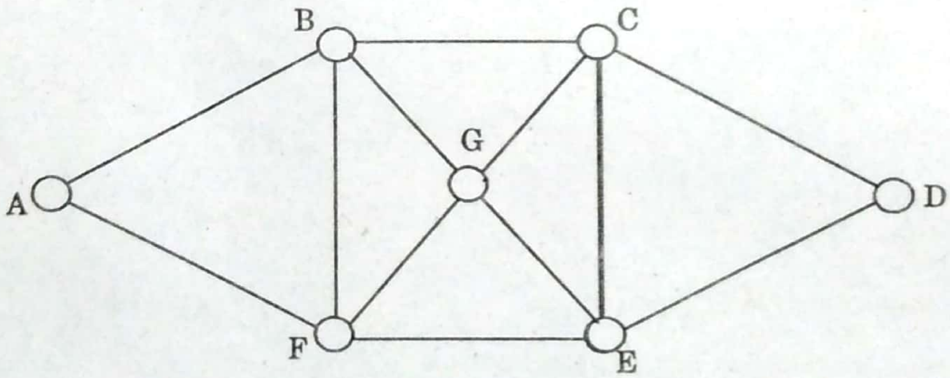
   (ii) $(A-B)-C = (A-C)-B$

   (iii) $(A-B)-C = (A-C)-(B-C)$.

10. Explain Pigeonhole principle. Prove, using Pigeonhole principle, that, if any 14 numbers from numbers 1 to 25 are chosen, then one of them will be a multiple of another.

11. With suitable example, explain Prim's algorithm.

12. Define Hamiltonian cycle and Hamiltonian circuit. Find Hamiltonian cycle and Hamiltonian path from the following:



13. Define Homomorphism and isomorphism in Groups. Explain their properties.

14. Define Distributive and Complemented lattices. Give examples. Prove that in a distributive lattice, if an element has a complement then this complement is unique.

(4 × 3 = 12 weightage)

Section C

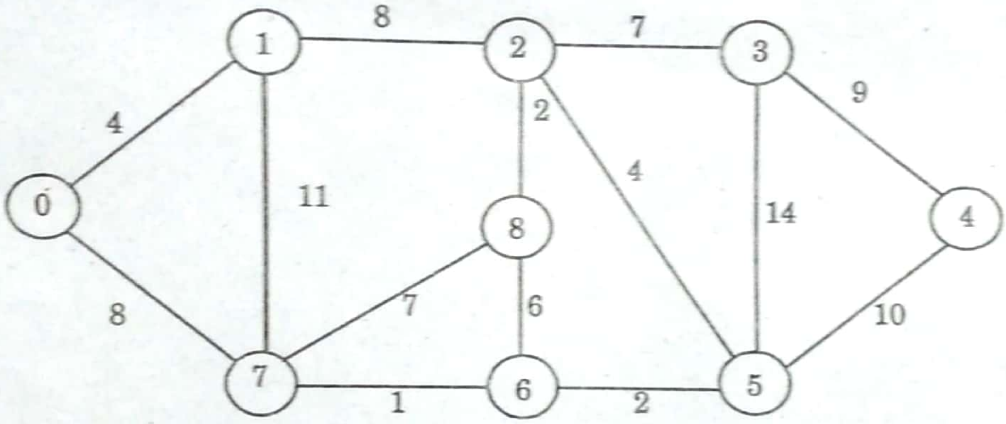
Answer any **two** *questions.*
Each question carries 5 weightage.

15. (i) Show that the relation "congruence modulo m" $(\equiv)$ over the set of positive integers is an equivalence relation. Also show that if $x_1 \equiv y_1$ and $x_2 \equiv y_2$, then $(x_1 + x_2) \equiv (y_1 + y_2)$.

(ii) Discuss properties of relations.

(3 + 2 = 5 weightage)

16. Apply Dijkstra's algorithm to find the shortest path between node 0 and all other nodes.



17. Prove the following :

(i) For any a, b, c and d in a lattice $(A, \leq)$, if $a \leq b$ and $c \leq d$ then $a \vee c \leq b \vee d$, $a \wedge c \leq b \wedge d$.

(ii) For any a and b in Boolean algebra prove that :

$\overline{a \vee b} = \bar{a} \wedge \bar{b}$, $\overline{a \wedge b} = \bar{a} \vee \bar{b}$,

18. Define Ring and integral domain. Give examples. Prove that every field is an integral domain.

(2 × 5 = 10 weightage)