

17P163

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Name:

Reg. No.

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2017

(CUCSS-PG)

CC17P CSS 1C01- DISCRETE MATHEMATICAL STRUCTURES

(Computer Science)

(2015 Admission Regular)

Time: Three Hours

Maximum: 36 Weightage

PART A

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

1. What is a bipartite graph? Give one example.
2. What are the conditions to form a subgroup from the given group?
3. Compare distributive and complemented lattices.
4. Give two examples for Posets which are not lattices.
5. What do you mean by closure of a relation?
6. If $A = \{1, 2\}$, determine if the following statements are true or false:
(a) $\{b\} \in A$ (b) $\{a\} \subseteq A$ (c) $\emptyset \in A$ (d) $a \subseteq A$
7. Construct the truth table for exclusive OR.
8. Show that identity element of a group is unique.
9. What do you mean by degree of a vertex?
10. Define Boolean algebra.
11. Differentiate equal sets and equivalent sets.
12. Define circuit and cycle. (12 × 1 = 12 Weightage)

PART B

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

13. Let $A = \{a, b, c\}$ and $P(A)$ be its power set. Let \subseteq be the inclusion relation on $P(A)$. Draw Hasse diagram.
14. Show that every cyclic group is an abelian group.
15. How is distance in a graph measured?
16. Show that the set $\{-1, 1, -i, i\}$ is a group with respect to multiplication.
17. Show the following equivalences
(a) $p \rightarrow (q \vee r) \Leftrightarrow (p \wedge \sim q) \rightarrow r$
(b) $(p \rightarrow q) \wedge (r \rightarrow q) \Leftrightarrow (p \vee r) \rightarrow q$
18. Determine which of the following sets is an empty set and list out all the elements in each sets.
(a) $\{a / a \text{ is an odd integer and } a^2 = 4\}$
(b) $\{a / a \text{ is an integer and } a < 1\}$

(c) $\{a / a \text{ is an integer and } a + 9 = 9\}$

19. Define bipartite and complete bipartite graphs with examples for each.

20. Express E in its complete sum-of-products form

(i) $E = x(xy^1 + x^1y + y^1z)$

(ii) $E = y(x+yz)^1$

21. Explain Kruskal's algorithm.

(6 × 2 = 12 Weightage)

PART C

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

22. Show that De Morgan's laws holds in a complemented distributive lattice.

23. Give an example of a graph G with $\delta(G) = \Delta(G) = 2$.

24. Define Lattice. Consider the lattice $L = \{1,2,3,4,6,12\}$, the divisors of 12 ordered by divisibility. Find

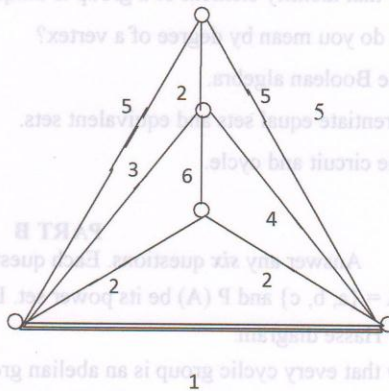
(i) The lower bound and upper bound of L

(ii) The complement of 4

(iii) Is L a complemented lattice?

25. Explain various types of quantifiers.

26. Let G be a connected graph. Find the minimal spanning tree of the following graph using Prim's algorithm.



27. Show that each of the following implications is a tautology by using truth tables

(a) $((p \rightarrow q) \wedge (q \rightarrow r)) \Rightarrow p \rightarrow r$

(b) $(p \wedge (p \rightarrow q)) \Rightarrow q$

(3 × 4 = 12 Weightage)
