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B. Tech SECOND SEMESTER (REGULAR/EX) EXAMINATION, AUGUST-2023

Course: Data Science/ AIML

Subject code: CD/AL-201

Subject Title: DISCRETE STRUCTURES

Maximum Marks: 70 *Time: 3 hrs.*

Note: Answer any FIVE Questions. All Questions carry equal marks.

1.

a) Let A = {2, 3, 4} and B = {3, 4, 5, 6, 7}. Assume a relation R from A to B such that (x, y) ∈R when x divides y. Determine R, its domain and range.

b) In a survey of 85 people it is found that 31 like to drink milk, 43 like coffee and 39 like tea. Also 13 like both milk and tea, 15 like milk and coffee, 20 like tea and coffee and 12 like none of the three drinks. Find the number of people who like all the three drinks. Display the answer using a Venn diagram.

2.

a) Differentiate between homomorphism and isomorphism of groups with examples.

b) What is group explain different types of groups

3.

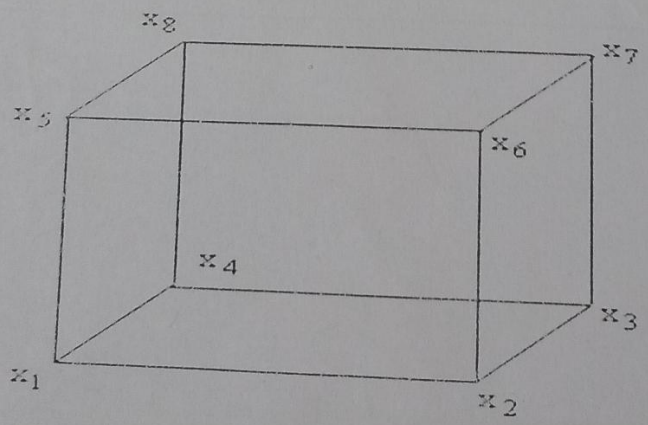
a) Define tautology and contradiction. Show that "If the sky is cloudy then it will rain and it will not rain", is not a contradiction.

b) What are the different types of quantifiers? Explain in brief.
Show that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x)(P(x) \wedge (\exists x)(Q(x)$

4.

a) What is graph? Give an account of the two matrix representations for graphs.

b) Define a Hamilton path. Determine if the following graph has a Hamilton circuit.



5.

a) Consider the set $A = \{2, 7, 14, 28, 56, 84\}$ and the relation $a \leq b$ if and only if a divides b. Give the Hasse diagram for the poset $(A, \leq)$.

b) Solve the recurrence relation

$$T(k) = 2T(k-1),\ T(0) = 1$$

6.

a) Let R be the relation on the set of ordered pairs of positive integers such that $((a,b),(c,d)) \in R$ if and only if $ad = bc$. Determine whether R is an equivalence relation or a partial ordering.

b) Test whether 101101, 11111 are accepted by a finite state machine M given as follows : $M=\{Q=\{q_0, q_1, q_2, q_3\}, \Sigma=\{0,1\}, \delta, q_0=q_0, F=\{q_0\}\}$
Where δ is

States	Inputs	
	0	1
q_0	q_2	q_1
q_1	q_3	q_0
q_2	q_0	q_3
q_3	q_1	q_2

7.

a) Write algorithm to find shortest path in weighted graph.
b) Define function explain different types of functions.

8.

Write the short notes ***(any two)***

a) Graph Coloring
b) Recurrence relation
c) Lattice
d) Types of functions