



Year and Program: 2018-19  
 B. Tech. Computer Science  
 & Engg.

School of Technology  
 Department of Computer Science  
 & Engg

SY B. Tech.  
 Semester – III

Course Code : CST203

Course Title: Discrete Structures

Day and Date: Friday  
 07-06-2019

End Semester Examination (ESE)

Max Marks: 100

Time: 2:30 to 5:30 pm.

Instructions: 1) All Questions are compulsory

2) Figures to the right indicate full marks

3) Draw neat diagrams with pencil wherever necessary

| Marks | Bloom's Level | CO |
|-------|---------------|----|
|-------|---------------|----|

**Q.1 A Solve following**

Consider the POSET  $A = \{1, 2, 3, 4, 6, 9, 12, 18, 36\}$  and  $\leq$  is divides relation. Find LUB & GLB for the sets  $\{6, 18\}$  and  $\{4, 6, 9\}$ ,  $\{1, 2, 4, 12\}$ . Draw Hasse diagram.

|    |    |     |
|----|----|-----|
| 07 | L3 | CO2 |
|----|----|-----|

-----OR-----

Let  $A = \{1, 2, 3\}$ ,  $B = \{p, q\}$  and  $C = \{a, b\}$ .  
 Let  $f: A \rightarrow B$  is  $f = \{(1, p), (2, p), (3, a)\}$   
 $g: B \rightarrow C$  is  $g = \{(p, b), (q, b)\}$ .

|    |    |     |
|----|----|-----|
| 07 | L2 | CO2 |
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Find  $g \circ f$  and show it pictorially.

**B Solve following**

Discuss the terms with respect to graph by giving suitable examples:

|    |    |     |
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| 08 | L2 | CO3 |
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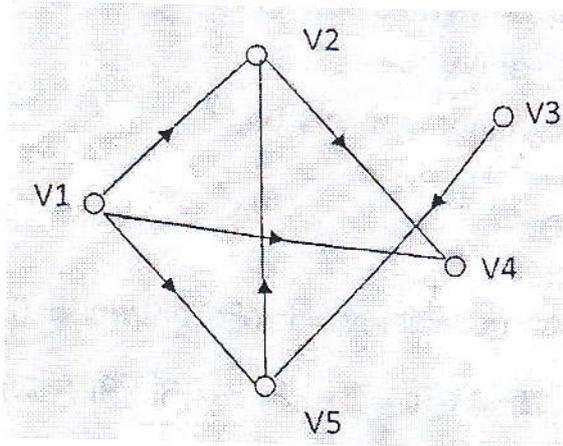
- Strongly connected
- Unilaterally connected
- path
- Simple path

-----OR-----

**ESE**

Find adjacency matrix and  $A^T$  and  $A \cdot A^T$  of following graph

08 L3 CO4



Q.2 A Solve following

Let  $R$  be a binary relation defined as

$$R = \{(a, b) \text{ belongs to } \mathbb{R}^2 \text{ and } a-b < 3\},$$

Determine whether  $R$  is reflexive, symmetric and transitive.

07 L3 CO1

-----OR-----

Construct the truth table for the compound proposition

i)  $(p \rightarrow q) \leftrightarrow (\neg p \rightarrow \neg q)$

ii)  $(p \rightarrow q) \rightarrow (q \rightarrow p)$

07 L3 CO1

B Solve following

What is a semigroup? Discuss the following w.r.t. semigroups.

i) Isomorphism

ii) Monomorphism

iii) Homomorphism

08 L4 CO3

-----OR-----

**ESE**

Consider the POSET

$A = (\{-4, 2, 3, 5, 6, 9, 12, 18, 16\}, /)$

Find LUB and GLB for the sets

$\{6, 18\}$  and  $\{4, 6, 9\}$

Q.3 Solve any TWO from A,B,C,D

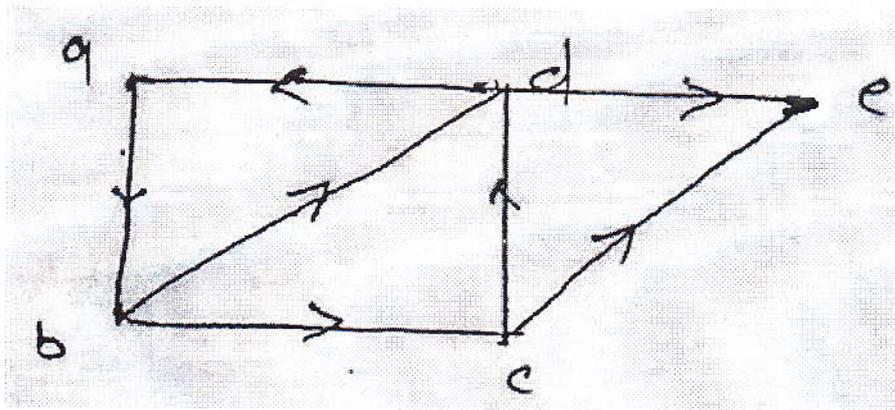
A Illustrate with examples

- i) Equivalence relation.
- ii) Inverse of a function.
- iii) Power set
- iv) Covering of a set.

08 L3 CO1

B Find indegree and outdegree of each vertex in following graph

08 L2 CO3



C Prove that

$((p \cup \sim q) \cup (\sim p \cup \sim q)) \cup q$  is a tautology.

08 L2 CO1

D  $X$  is any given set and  $P(X)$  is its power set. Find the zeroes of the semigroups  $(P(X), \cap)$  and  $(P(X), \cup)$ . Are these monoids? If so, give their identities.

08 L3 CO1

**Q. 4 Solve any TWO from A,B,C**

- A Draw the POSET of  $P(A)$  (power set of set  $A$ ) where  $A = \{2,4,6\}$  under subset relation. Prove that it is a lattice. 09 L2 CO1
- B Simplify following Boolean expression by using K-Map  
 $Z = f(A,B,C,D) = \bar{A} \bar{B} CD + A \bar{B} C + \bar{A} BD + ABC$  09 L4 CO3
- C Find  $L1 \times L1$  ( product of lattices) if  $L1 = \{0,1\}$  and partial ordering is  $\leq$ . Draw the corresponding diadram and list the relation. 09 L2 CO2

**Q. 5 Solve any TWO from A,B,C**

- A A box contains 6 white balls and 5 black balls. Find the number of ways 4 balls can be drawn from the box if 09 L5 CO5
- i) Two must be white
  - ii) All of them have the same color
  - iii) One is white and rest are black

- B When a certain defective die is tossed, the numbers from 1 to 6 will appear with following probabilities 09 L5 CO5  
 $p(1) = 2/8, p(2) = 3/18, p(3) = 4/18, p(4) = 3/18, p(5) = 4/18, p(6) = 2/18$

Find the probability that

- i) An odd number is on top
  - ii) A prime number is on top
  - iii) A number less than 5 is on the top
- C Explain rule of product and rule of sum with example. 09 L5 CO5  
Find the number of ways to form an identifier having length 3 if first place is filled by a character from  $\{A...Z\}$ , second place is filled by a digit from 0 to 9 and the third place is filled by a character from  $\{A...Z\}$ .

Q.6 Solve any THREE from A,B,C,D

- A Describe properties of lattice and Boolean algebra. 06 L2 CO3
- B Prove that  $S=\{2,4,6,12,24\}$  is a complemented lattice under divides relation. 06 L3 CO3
- C Write a note on information content and mutual information. 06 L2 CO5
- D Three dice were rolled. Given that no two faces were the same, what is the probability that there was an ace? 06 L3 CO5

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