



Sanjay Ghodawat University, Kolhapur
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EXM/P/09/00

Year and Program: 2018-19

School of Technology

SY B. Tech.

B. Tech. Computer Science

Department of Computer Science

Semester – III

& Engg.

& Engg

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
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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 $C = \{a, b\}$.

07 L2 CO2

Let $f: A \rightarrow B$ is $f = \{(1, p), (2, p), (3, a)\}$

$g: B \rightarrow C$ is $g = \{(p, b), (q, b)\}$.

Find $g \circ f$ and show it pictorially.

B Solve following

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

08 L2 CO3

i) Strongly connected

ii) Unilaterally connected

iii) path

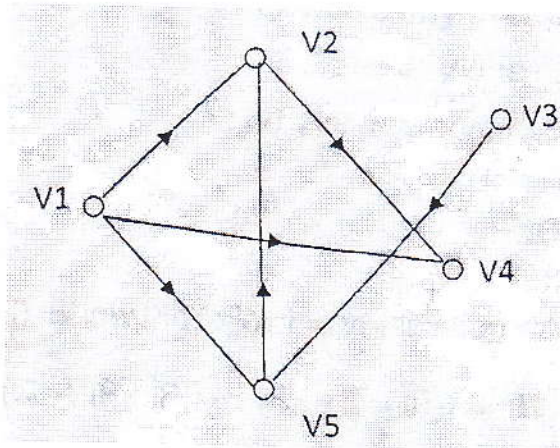
iv) Simple path

-----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

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

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.

08 L4 CO3

i) Isomorphism

ii) Monomorphism

iii) Homomorphism

-----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

08 L3 CO1

i) Equivalence relation.

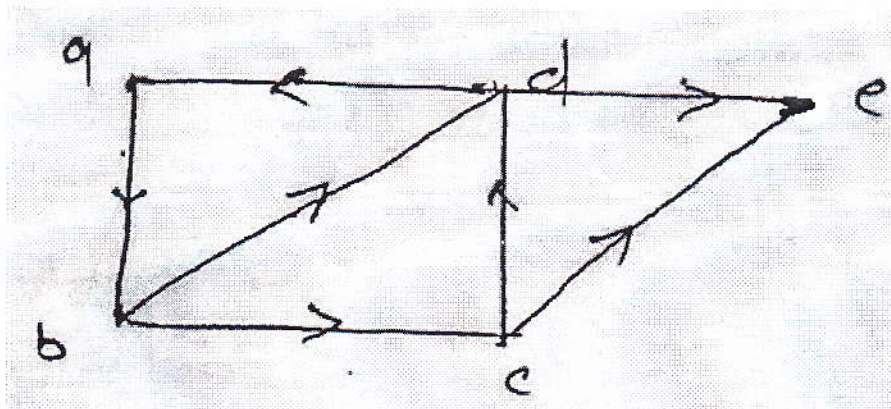
ii) Inverse of a function.

iii) Power set

iv) Covering of a set.

B Find indegree and outdegree of each vertex in following graph

08 L2 CO3



C Prove that

08 L2 CO1

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

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
 $p(1) = 2/8, p(2) = 3/18, p(3) = 4/18, p(4) = 3/18, p(5) = 4/18, p(6) = 2/18$ 09 L5 CO5
- 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. 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 $\{A...Z\}$. 09 L5 CO5

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

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|---|---|----|----|-----|
| 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 |
