DES old

Sanjay Ghodawat University, Kolhapur
Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

EXM/P/09/00

Year and Program:2019-20
B. Tech. Computer Science & Engg.
Course Code : CST203
Day and Date: Wednesday 20/11/19

School of Technology
Department of Computer Science & Engg
Course Title: Discrete Structures

End Semester Examination (ESE)

SY B. Tech.
Semester III
Time 3hrs
10.30am to 1.30pm.
Max Marks:100

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**	**Attempt following**			
		Draw the Hasse diagram for the POSET A= {1,2, 4, 6, 12, 24, 48, 72} under partial ordering "divides" relation. Find LUB & GLB for the sets {2, 4, 6}, and {12,24, 48}.	**07**	**L3**	**CO2**
		-- OR --			
		Let X = {1, 2, 3} and f, g, h , j be functions from X to X given by f= { <1,2>,<2,3>,<3,1>}, g = { <1,2>,<2,1>,<3,3>} h= {<1,1>,<2,2>,<3,1> }, j = {<1,1>,<2,2>,<3,3>} Find fog, gof, $fohog$, jog, hoh.	**07**	**L3**	**CO2**
	B	**Attempt following**			
		Describe following graph by using adjacency list and adjacency matrix.	**08**	**L2**	**CO3**

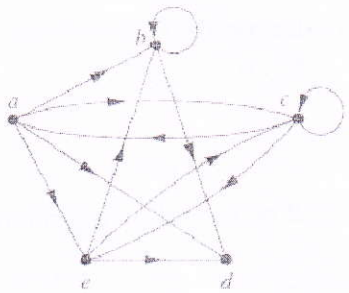


Fig. 1

-- OR --

		Find adjacency matrix A, A^T and A. $A^T$of following graph.	**08**	**L3**	**CO4**

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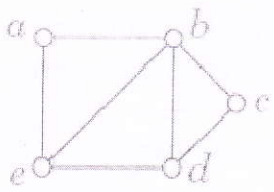


Fig. 2

Q.2 A Attempt following

Test the validity of the following argument: **07** **L3** **CO1**

P: If I study, then I will not fail Mathematics.
Q: If I do not play basketball, then I will study.
R: I failed Mathematics.
H: Therefore I must have played basketball.

-- OR --

Let p, q, and r be the propositions **07** **L1** **CO1**
p :You have the flu.
q :You miss the final examination.
r :You pass the course.
Express following compound symbolic propositions as English sentences.
a) $p \rightarrow q$ **b)** $\neg q \leftrightarrow r$ **c)** $q \rightarrow \neg r$ **d)** $p \vee q \vee r$
e) $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$ **f)** $(p \wedge q) \vee (\neg q \wedge r)$ **g)** $\neg p$

B Attempt following

What is a semigroup? Justify that is $(\mathbf{N}, \times)$ is semigroup and monoid, where **N** is set of positive integers. Let A and B denote, respectively, the set of even and odd positive integers. Then prove that $(A, \times)$ and $(B, \times)$ are subsemigroups of $(\mathbf{N}, \times)$. **08** **L4** **CO3**

-- OR --

Consider the group $G = \{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7. Find the multiplication table of G. Also find 2^{-1}, 3^{-1}, 6^{-1}. **08** **L3** **CO3**

Q. 3 Solve any TWO from following

A Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relation from A to B: $R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$ **08** **L3** **CO1**
(i) Determine the matrix of the relation.
(ii) Draw the arrow diagram of R.
(iii) Find the inverse relation R^{-1} of R.
(iv) Determine the domain and range of R.

B Consider following graph G. Find **08** **L1** **CO3**
(i) all simple paths from A to F; (ii) diam(G), the diameter of G; (iii) all cycles which include vertex A; (iv) $d(A,F)$, the distance from A to F.

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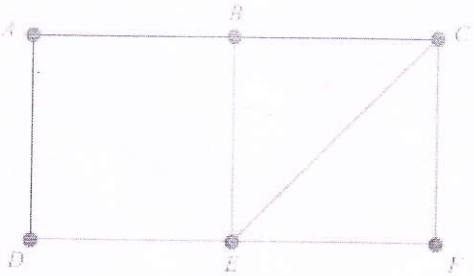


Fig. 3

C Show that **08** **L3** **CO1**

i) The propositions $\neg(p \wedge q)$ and $\neg p \vee \neg q$ are logically equivalent.
ii) The proposition $p \wedge \neg(p \vee q)$ is a contracdiction.

D Consider the set **Q** of rational numbers, and let * be the operation on **Q** defined by $a * b = a + b - ab$ **08** **L3** **CO1**
(i) Find: 3 * 4; 2 * (−5) (ii) Is (**Q**, *) a semigroup? Justify your answer.
(iii) Find the identity element for *.
(iv) Do any of the elements in **Q** have an inverse?

Q. 4 Solve any TWO from following

A Let S = {1, 2, 3, . . . , 8} be ordered as in following figure and let A = (2, 3, 6}, B = {1, 2, 5}. Find the upper and lower bounds of sets A and B. Identify supremum(A), infimum (A), supremum(B) and infimum (B) if exists. **09** **L2** **CO1**

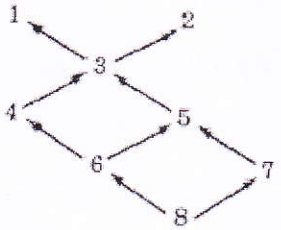


Fig. 4

B Simplify following Boolean expression by using K-Map. **09** **L3** **CO3**

xyz + xyz' + x'yz' + x'y'z

C Which of the partially ordered sets in following figure are lattices? Justify your answer. **09** **L4** **CO2**

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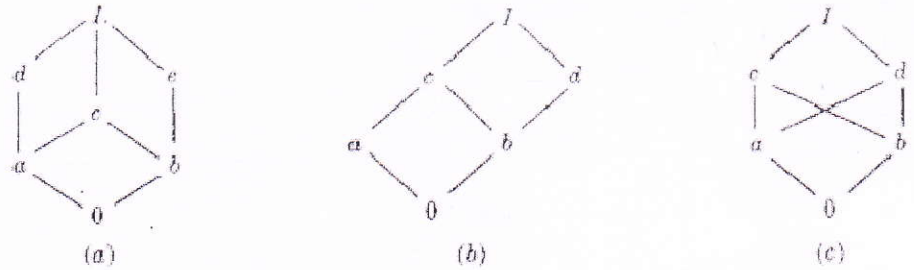


Fig. 5

Q. 5 **Solve any TWO from following**

A	Find the number n of distinct permutations that can be formed from all the letters of each word: (i) THOSE; (ii) UNUSUAL; (iii) SOCIOLOGICAL.	**09**	**L3**	**CO5**
B	A class contains 10 students with 6 men and 4 women. Find the number n of ways to: (a) Select a 4-member committee from the students. (b) Select a 4-member committee with 2 men and 2 women. (c) Elect a president, vice president, and treasurer.	**09**	**L3**	**CO5**
C	Explain rule of product and rule of sum with suitable examples. A box contains 8 blue socks and 6 red socks. Find the number of ways in which two socks can be drawn from the box if: (i) They can be of any color. (ii) They must be of the same color.	**09**	**L3**	**CO5**

Q.6 **Solve any THREE from following**

A	Describe properties of lattice and Boolean algebra.	**06**	**L2**	**CO3**
B	Determine if following lattice a complemented lattice.	**06**	**L3**	**CO3**

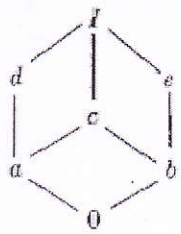


Fig. 6

C	Explain the algorithm to generate combinations of 4 numbers out of the set A = {1,2,3,4,5,6}.	**06**	**L2**	**CO5**
D	Discuss the concepts of information content and mutual information in information theory.	**06**	**L3**	**CO5**

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