Name:
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School of Engineering

Second Sessional Examination, Odd Semester (AS: 2023-24)

B. Tech: CSE/CSAI/CCML/IOTBC Year: II Semester: III

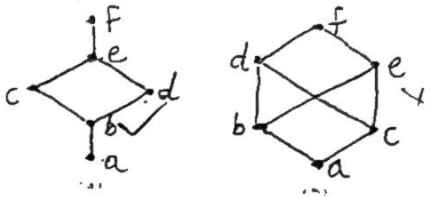
Course Title: Discrete Mathematics | Max Marks: 60

Course Code: BCS3301 | Time: 3hrs

Instructions if any: Read the question Carefully.

SECTION 'A' Q.N.1. Attempt all parts of the following:		Course Objective	Marks
a)	For set A and B prove that: $(A \cap B) \cup (A \cap \sim B) = A$	CO1	1
b)	If $f(x) = 3x+1$ and $g(x) = x^2$, then determine gof(x)	CO1	1
c)	Define Modular Lattice.	CO2	1
d)	Define Cosets.	CO2	1
e)	Use **quantifier** to Convert the following statement in quantified expressions of predicate logic *"All rational numbers are real numbers."*	CO3	1
f)	Define Complemented Lattice.	CO2	1
g)	Define Hamiltonian Path	CO4	1
h)	Define Binary Search Tree	CO4	1

SECTION 'B' Q.N.2. Attempt any two parts of the following:		Course Objective	Marks
a)	For each of these relations defined on the set {1, 2, 3, 4}, decide whether it is reflexive, whether it is symmetric, whether it is anti-symmetric, and whether it is transitive. (i) {(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)} (ii) {(1, 1), (2, 2), (3, 3), (4, 4)} (iii) {(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)}	CO1	6
b)	Solve the recurrence relation: $a_r - 3a_{r-1} + 2a_{r-2} = 0$, $r \geq 2$ by the generating function method with $a_0 = 2$ and $a_1 = 3$.	CO4	6
c)	Determine whether the POSETs represented by each of the following Hasse Diagrams are	CO2	6



		Course Objective	Marks
d)	(i) Suppose that C = "The cheese is good." F = "The french fries are greasy." W = "The wings are spicy." Translate the following logical statements into words $(\neg C \wedge F) \rightarrow W$ (ii) Draw a **Truth table** for the following compound statement $(\neg P \vee Q) \leftrightarrow (Q \rightarrow R)$	CO3	6

SECTION 'C' Q.N.3. Attempt any two parts of the following:		Course Objective	Marks
a)	For any three non empty set A, B, and C prove that $A \times (B - C) = (A \times B) - (A \times C)$	CO1	5
b)	Show that the mapping defined by f: $R-\{3\} \rightarrow R-\{1\}$ such that $f(x) = (x-1)/(x-3)$ is bijective and find the inverse of this function, where R is a set of real numbers.	CO1	5
c)	Use mathematical induction to prove that $6^{n+2}+7^{2n+1}$ is divisible by 43 for $n \geq 1$	CO1	5

Q.N.4. Attempt any two parts of the following:			
a)	Prove that set R = {0, 1, 2, 3, 4, 5} is a commutative ring with respect to addition module 6 ($+_6$) and multiplication module 6 (X_6).	CO2	5
b)	Draw a Hasse Diagram of $(P(A), \subseteq)$ where A = {a, b, c}. Then prove that it is a Lattice.	CO2	5
c)	Let G = {1,-1,i,-i} with the operation of ordinary multiplication on G be an algebraic structure, where $i=\sqrt{-1}$.	CO2	5

	[illegible] (iii) [illegible] group, if [illegible] cyclic group then determine the generator generators of the group G.		
Q.N.5. Attempt any two parts of the following:			
a)	Simplify following Boolean function using K map $F(A,B,C,D) = \sum(m_0, m_1, m_2, m_4, m_5, m_6, m_8, m_9, m_{12}, m_{13}, m_{14})$	CO3	5
b)	Use rules of inference to show that the hypotheses "Randy works hard," "If Randy works hard, then he is a dull boy," and "If Randy is a dull boy, then he will not get the job" imply the **conclusion**: "Randy will not get the job."	CO3	5
c)	Write the contra-positive, converse and inverse of the following statements: (i) If today is Sunday, then I will wash the car. (ii) If $x+5=8$ then $x=3$	CO3	5
Q.N.6. Attempt any two parts of the following:			
a)	Write short notes on following: i) Multi Graphs ii) Planar Graphs iii) Euler Graph iv) Pigeon hole principle. v) Chromatic Number	CO4	5
b)	Solve following recurrence relation. $a_r + 6a_{r-1} + 9a_{r-2} = 3$ given that $a_0 = 0$ and $a_1 = 1$	CO4	5
c)	How many vertices do the graph will have if it contains, 3 vertices of degree 2, 4 vertices of degree 3, rest vertices have degree 4. Number of edges in a graph is 15.	CO4	5

COs	Questions Numbers	Total Marks
CO1	Q1 (a),(b), Q2 (a), Q3	23
CO2	Q1 (c),(d), Q2 (c), Q4	23
CO3	Q1 (e)(f) Q2 (d), Q5	23
CO4	Q1.(g)(h).Q2(b), Q6	23