Student University Roll No.:	Printed Pages:2

School of Engineering

Second Sessional Examination, Odd Semester (AS: 2021-22)

B. Tech: CSE **Year:II[nd]** **Semester:III[rd]**

Course Title: Discrete Mathematics

Course Code: BCS3301 **Max Marks: 60** **Time: 3*hrs***

Note: The question paper is divided into three sections A, B and C.

SECTION 'A' Q.N.1. Attempt all parts of the following:		Course Objective	Marks
a)	Express the following set in Roster method: A = { x : x is a prime number < 10}.	CO1	1
b)	Define complemented lattice.	CO2	1
c)	Define universal and existential quantifiers.	CO3	1
d)	Show the propositions $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent.	CO3	1
e)	Write absorption law for Boolean Algebra.	CO3	1
f)	Draw a complete graph with 5 vertices.	CO4	1
g)	Define Binary Search Tree.	CO4	1
h)	State pigeonhole principle.	CO4	1

SECTION 'B' Q.N.2. Attempt any two parts of the following:		Course Objective	Marks
a)	Write Determine whether each of these functions is a bijection from R to R. i. $f(x) = 2x + 1$ ii. $f(x) = x^2 + 1$ iii. $f(x) = x^3$ iv. $f(x) = (x^2 + 1)/(x^2 + 2)$	CO1	6
b)	State and proof Lagrange'stheorem.	CO2	6
c)	Show that t is a valid conclusion from -the premises $p \rightarrow q$, $q \rightarrow r$, $r \rightarrow s$, $\neg s$ and $p \vee t$	CO3	6
d)	Solve the following recurrence relation $a_{n+2} - 2a_{n+1} + a_n = 2n$.with $a_0 = 2$, $a_1 = 1$ using generating functions.	CO4	6

SECTION 'C'		Course Objective	Marks
Q.N.3. Attempt any two parts of the following:			
a)	Let A = {1,2,3,4,5,6} and let R be the relation x divides y. i. Write R as a set of ordered pairs. ii. Draw its directed graph. iii. Find R^{-1}	CO1	5
b)	Explain Maximal, minimal, Lower Bound, Upper Bound, GLB and LUB elements in Hash Diagram.	CO2	5
c)	Prove that $3^n > n$ for all positive integers n.	CO3	5
Q.N.4. Attempt any two parts of the following:			
a)	Show that the set G = {1,2,3,4,5,6 } is a finite abelian group of order 6 w.r.t multiplication modulo 7.	CO2	5
b)	Determine whether {1,2,3,4,6,12,/)is a lattice.	CO2	5
c)	Show that the inverse of an element in a group (G,*) is unique.	CO2	5
Q.N.5. Attempt any two parts of the following:			
a)	State the contrapositive,converse, and inverse of following condition statement. "If itsnows tonight, then I will stay at home".	CO3	5
b)	Simplify the three variable Boolean expression π (1,2,4,7) using Boolean algebra.	CO3	5
c)	Let p, q, and r be the propositions p:You have the flu. q :You miss the final examination. r :You pass the course. Express each of these propositions as an English sentence. i. $p \rightarrow q$ ii. $p \vee q \vee r$ iii. $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$ iv. $(p \wedge q) \vee (\neg q \wedge r)$	CO3	5
Q.N.6. Attempt any two parts of the following:			
a)	Define tree and its properties. Also explain pre-order, in-order and post-order of tree	CO4	5

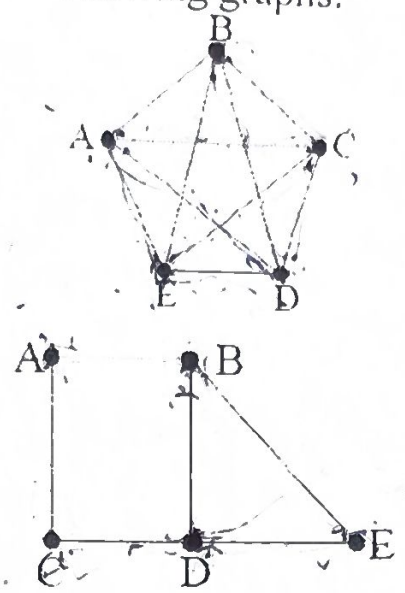
	with the help of an example.		
b)	Construct a Binary Search Tree by inserting the following sequence of numbers... 10,12,5,4,20,8,7,15, and 13	CO4	5
c)	Find the Euler path and Euler circuit, if it exists, in the following graphs. 	CO4	5

Table 1: Mapping between COs and questions

(Number of COs may vary from course to course)

COs	Questions Numbers	Total Marks
CO1	1(a), 2(a), 3(a)	12
CO2	1(b), 2(b), 3(b),4(a),4(b),4(c),	27
CO3	1(c, d, e), 2©,3©,5(a, b, c),	29
CO4	1(f, g, h), 2d, 6(a, b, c)	24

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