

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Hi-Tech Institute of Engineering & Technology
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
MODEL TEST PAPER
DSTL

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 7 = 14

a.	Let R be a relation on set A with cardinality n. Write down the no. reflexive and symmetric relation on set A.
b.	If L be a lattice , then for every a and b in L ,prove that $a \wedge b = a$ if and only if $a \leq b$
c.	Write the negation of the following statement – “If I wake up early in the morning, then I will be healthy.”.
d.	Define what is Big -O Notation with respect of growth of functions.
e.	Identify whether $(p \wedge q) \rightarrow (p \vee q)$ is tautology or contradiction with using truth table.
f.	State and justify “Every cyclic group is an abelian group.”
g.	Explain Euler’s formula. Determine number of regions if a planar graph has 30vertices of degree 3 each.

SECTION B

2. Attempt any three of the following:

7 x 3 = 21

a.	State and prove lagrange theorem for group.
b.	If a connected planar graph G has n vertices, e edges and r region, then $n - e + r = 2$.
c.	Simplify the Boolean function $f(A,B,C,D) = \{(0,1,2,3,4,5,6,7,8,9,11)\}$ also draw the logic circuit of simplified F.
d.	Solve the following recurrence relation by using generating function $a_n + 5a_{n-1} + 6a_{n-2} = 42.4^n$, where, $a_0 = 1$ and $a_1 = -2$
e.	Convert the following two statements in quantified expressions of predicate logic a. For every number there is a number greater than that number b. Not every man is perfect c. Sum of every 2 integer is an integer

SECTION C

3. Attempt any one part of the following:

7 x 1 = 7

(a)	Identify whether each of the following relations defined on the set $X = \{1,2,3,4\}$ are reflexive, symmetric, transitive or antisymmetric? <i>(i)</i> $R1 = \{(1,1), (1,2), (2,1)\}$ <i>(ii)</i> $R2 = \{(1,1), (1,2), (1,4), (2,1), (2,2), (3,3), (4,1), (4,4)\}$ <i>(iii)</i> $R3 = \{(2,1), (3,1), (3,2), (4,1), (4,2), (4,3)\}$
(b)	Let L1 be the lattice defined as D6 and L2 be the lattice $(P(S), \leq)$, where P(S) be the power set defined on set $S = \{a, b\}$. Justify that the two lattices are isomorphic .

4. Attempt any one part of the following:

7 x 1 = 7

(a)	Use rules of inference to Justify that the three hypotheses (i) “If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on.” (ii) “If the sailing race is held, then the trophy will be awarded.” (iii) “The trophy was not awarded.” imply the conclusion. iv.) “it rained.”
(b)	Define tautology, contradiction and contingency? Check whether $(p \vee q) \wedge (\sim p \vee r) \rightarrow (q \vee r)$ is a tautology, contradiction or contingency.

**BTECH**
(SEM III) THEORY EXAMINATION 2021-22
DSTL**5. Attempt any one part of the following:****7 x 1 = 7**

(a)	Define Boolean algebra. Show that $a' \cdot [(b'+c)'+ b \cdot c] + [(a+b)'] \cdot c = a' \cdot b$ using rules of Boolean Algebra. Where a' is the complement of an element a .
(b)	Justify that "If $f: A \rightarrow B$ and $g: B \rightarrow C$ be one-to-one onto functions, then $g \circ f$ is also one to one onto and $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ ".

6. Attempt any one part of the following:**7 x 1 = 7**

(a)	A subgroup H of a group G is a normal subgroup if and only if $h^{-1}gh \in H$ for every $h \in H$ and $g \in G$
(b)	In a group $(G, *)$ prove that i. $(a^{-1})^{-1} = a$ ii. $(ab)^{-1} = b^{-1}a^{-1}$

7. Attempt any one part of the following:**7 x 1 = 7**

(a)	Find the numbers between the 100 to 1000 that are divisible by 3 or 5 or 7.
(b)	Solve the recurrence relation using generating function. $a_{n+2} - 5a_{n+1} + 6a_n = 2$, with $a_0 = 3$ and $a_1 = 7$.