Roll No: ☐☐☐☐☐☐☐☐☐☐☐☐☐

Subject Code:
BCS303

Hi-Tech Institute of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
MODEL TEST PAPER 2
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.	Explain pigeonhole principle with example.
b.	Translate the conditional statement – " If it rains, then I will stay at home" into contrapositive, converse and inverse statement.
c.	Write the negation of the following statement – "If I wake up early in the morning, then I will be healthy.".
d.	Differentiate complemented lattice and distributed lattice.
e.	What is idempotent law of Boolean algebra.
f.	Define the following terms (any two) with example. i.) DNF ii.) CNF iii.) Universal gates
g.	Define normal subgroup..

SECTION B

2.   **Attempt any** *three* **of the following:**   **7 x 3 = 21**

a.	Draw the Hasse's diagram of the POSET (L, $\sqsubseteq$, where
	        L = {S0, S1, S2, S3, S4, S5, S6, S7}, where the
	        sets are given by S0 = {a,b,c,d,e,f},
	        S1 = {a,b,c,d,e} , S2 = {a,b,c,e,f},
	        S3 = {a,b,c,e}, S4 = {a,b,c} , S5 = {a,b} , S6 = {a,c} , S7 = {a}.
	     Also Explain the different types of lattice.

b.	Describe Planar graph and express Euler's formula for planar graph.
c.	Find the composite mapping gof if f: R $\rightarrow$ R is given by f(x) = e^x and g: R $\rightarrow$ R is given by g(x) = sinx Also state and derive De – Morgan's law.
d.	Explain Cyclic group. Let H be a subgroup of a finite group G. Justify the statement "the order of H is a divisor of the order of G".

e.	Explain the following terms with example:
	     i. Graph coloring and chromatic number.
	     ii. How many edges in K7 and K3,3
	     iii. Isomorphic Graph and Hamiltonian graph.
	     iv. Bipartite graph.

SECTION C

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

(a)	If f : R → R, g : R → R and h : R → R defined by $f(x) = 3x^2 +2$, g(x) = 7x – 5 and h(x) = 1/x. Compute the following composition functions
	      i. (fogoh)(x)
	      ii. (gog)(x)
	      iii. (goh)(x)
	      iv. (hogof)(x)

(b)	Simplify the Boolean function
	    F (A, B, C, D) = $\sum$ (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11)
	    Also draw the logic circuit of simplified F.

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

(a)	Prove the validity of the following argument. If Mary runs for office, She will be elected. If Mary attends the meeting, she will run for office. Either Mary will attend the meeting or she will go to India. But Mary cannot go to India. "Thus Mary will be elected".

(b)	Convert the following two statements in quantified expressions of predicate logic
	          i. For every number there is a number greater than that number.
	          ii. Sum of every two integer is an integer.
	          iii. Not Every man is perfect.
	          iv. There is no student in the class who knows Spanish and German

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

(a)	Define the binary operation * on Z by x*y=x + y + 1 for all x,y belongs to set of integers. Verify that (Z,*) is abelian group? Discuss the properties of abelian group.
(b)	i) Justify that "The intersection of any two subgroup of a group (G,*) is again a subgroup of (G,*)". ii.)Justify that "If a,b are the arbitrary elements of a group G then $(ab)^2 = a^2b^2$ if and only if G is abelian.

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

(a)	Use generating function to find the number of ways Rs 23 can by paid by using4 coins of Rs 5, 6 coins of Rs 2 and 4 coins of Rs 1.
(b)	A box contains 10 blue, 20 red , 8 green , 15 yellow , 25 white balls. How many balls must be choosen to ensure that we have 12 balls of the same colour.

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

(a)	Justify that for any sets A, B, and C: i) $(A – (A \cap B)) = A – B$ ii) $(A – (B \cap C)) = (A – B) \cup (A – C)$
(b)	Convert the following boolean function in DNF as well as CNF. F (x,y,z) = xy + xz + xy