PAPER ID-311571

Subject Code: BCS303

Roll No: | | | | | | | | | | | | | |

BTECH

(SEM III) THEORY EXAMINATION 2023-24

DISCRETE STRUCTURES & THEORY OF LOGIC

TIME: 3HRS **M.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**

Q no.	Question	Marks	CO
a.	Determine the greatest lower bound and least upper bound of the set {2, 3, 6}, if they exist, in the Poset (D24, /).	2	1
b.	Express power set of each of these sets. 1) {Ø,{ Ø}} 2) {a,{a}}	2	1
c.	Investigate whether the function $f(x) = x^2 - 1$ is injective or not for f: R→R.	2	2
d.	Express E(x, y, z) = xy+ y'z into its complete sum-of-products form.	2	2
e.	Construct inverse of the following statement "If I wake up early in the morning, then I will be healthy."	2	3
f.	Show that identity element is unique in a group.	2	4
g.	Compare Euler circuit and Hamiltonian circuit.	2	5

SECTION B

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

Q no.	Question	Marks	CO
a.	Construct the Hasse Diagram for (P(S), ⊆) where P(S) is a power set defined on set S={a, b, c}. Determine whether it is a Lattice or not.	7	1
b.	Solve the following Boolean functions using K-map: (i) F(A,B,C,D) = ∑ (m0,m1,m2,m4,m5,m6,m8,m9,m12,m13,m14) (ii) F(A,B,C,D) = ∑ (0,2,5,7,8,10,13,15)	7	2
c.	Show the validity of the following argument: hypotheses: "It is not sunny this afternoon and it is colder than m yesterday. We will go swimming only if it is sunny. If we do not go swimming, then we will take a canoe trip. If we take a canoe trip, then we will be home by sunset. conclusion: "We will be home by sunset."	7	3
d.	Let G= {1, -1, i, - i} with the binary operation multiplication be an algebraic structure, where $i = \sqrt{-1}$ then determine whether G is an Abelian group. Also if G is cyclic Group, then determine the generator of G.	7	4
e.	Explain Pigeon hole principle. Describe generalized form of Pigeon hole principle. If 6 colors are to paint 37 homes. Show that at least 7 of them will be of same color.	7	5

Subject Code: BCS303

PAPER ID-311571

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2023-24
DISCRETE STRUCTURES & THEORY OF LOGIC

TIME: 3HRS **M.MARKS: 70**

SECTION C

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

Q no.	Question	Marks	CO
a.	Let R be a binary relation on the set of all strings of 0 and 1 such that R = {(a,b): a and b have same number of 0's}. Show that whether R is reflexive, symmetric, transitive or a partial order relation.	7	1
b.	Show that (D42, /) is lattice. Compare the distributive and complemented lattice with example.	7	1

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

Q no.	Question	Marks	CO
a.	Solve the following Boolean function using K-map: F(A,B,C) = (1,2,5,7) and D(0,4,6) using SOP.	7	2
b.	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)	7	2

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

Q no.	Question	Marks	CO
a.	Test the validity of the following argument. "If there was a ball game, then traveling was difficult. If they arrived on time, then traveling was not difficult. They arrived on time. Therefore, There was no ball game."	7	3
b.	Describe ∃ and ∀ Quantifiers with example. "There is someone who got an A in the course" convert this sentence into predicate logic using quantifiers. Prove the following argument. All man are mortal. Socrates is a man. Therefore, Socrates is mortal.	7	3

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

Q no.	Question	Marks	CO
a.	Describe Algebraic structure, semigroup, monoid and group. Also explain the relationship among them.	7	4
b.	Consider group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7. (a) Construct the multiplication table of G. (b) Compute $2^{-1}, 3^{-1}, 6^{-1}$ (c) Compute the orders and subgroups generated by 2 and 3. (d) Is G cyclic?	7	4

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

Q no.	Question	Marks	CO
a.	Compare bipartite and complete graph with example. Draw $K_{3,4}$ and K_5. Explain why these two graphs are not planar.	7	5
b.	Show that $K_{3,3}$ satisfies in equality $\|E\| \leq 3\|V\| - 6$, but it is non-planar.(V=No. of Vertices, E=No. of Edges, R=No. of Regions)	7	5