BTECH

(SEM III) THEORY EXAMINATION 2025-26

DISCRETE STRUCTURES & THEORY OF LOGIC

TIME: 3 HRS 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 07 = 14**

Q no.	Question	CO
a.	Define a lattice and state the meaning of upper bound and lower bound in a lattice.	1
b.	What is meant by a reflexive relation? State its basic property.	2
c.	Find the domain and range of the function $f(x)=1-\|x\|$.	2
d.	What is meant by an existential quantifier? Explain it with a simple statement.	3
e.	Define zero divisor of a ring.	4
f.	How many 4 digits number can be formed by using the digits 2,4,6,8 when the repetition of digits is allowed.	5
g.	Draw a graph that has a Hamiltonian path not have a Hamiltonian circuit.	5

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 07**

Q no.	Question	CO
a.	If R is an equivalence relation on A, then prove that R^{-1} is also equivalence relation on A.	1
b.	Explain the basic concepts of Boolean algebra and state any four fundamental laws of Boolean algebra.	2
c.	Translate the following statements in symbolic form: (i) The sum of two positive integer is always positive. (ii) Everyone is loved by someone. (iii) Some people are not admired by everyone. (iv) If a person is female and is a parent, then this person is someone's mother.	3
d.	State and prove Lagrange's theorem.	4
e.	Show that in any room of people who have been doing handshaking there will always be at least two people who have shaken hands the same number of times.	5

SECTION C

3. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO
a.	Define Lattice and the properties of lattice.	1
b.	Explain the following terms: (i) POSET (ii) Hasse Diagram	1

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4. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO
a.	Usc a Karnaugh map to find a minimal sum for E= y't' + y'z't + x'y'zt + yzt'	2
b.	Show that the number of minimal Boolean function in n variables are 2^{2^n}.	2

5. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO
a.	Prove that the statement "if n is an integer, then n^2-n+4! Is a prime number" is false.	3
b.	Explain the following terms with suitable example: (i) Converse (ii) Disjunction (iii) Conjunction	3

6. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO
a.	Let H be a subgroup of a finite group G. Prove that order of H is a divisor of order G.	4
b.	How many generators are there of the cyclic group G of order 10.	4

7. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO
a.	Let G be a 3-regualr graph with n vertices. What is the sum of the degree of the vertices? Show that in such a graph n must be even.	5
b.	Prove that if a connected graph G is decomposed into two subgraphs g_1 and g_2, there must be at least one vertex common between g_1 and g_2.	5