Printed Page:-04 **Subject Code:- ACSE0306 /ACSEH0306**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Discrete Structures

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Two sets are called disjoint if there ______________ is the empty set. (CO1,K2) 1

(a) Union

(b) Difference

(c) Intersection

(d) Complement

1-b. Let C and D be two sets then C – D is equivalent to __________ (CO1,K2) 1

(a) C' ∩ D

(b) C'∩ D′

(c) C ∩ D′

(d) None of the mentioned

1-c. Let a binary operation '*' be defined on a set A. The operation will be commutative if ________.(CO2,K1) 1

(a) a*b=b*a

(b) (a*b)*c=a*(b*c)

(c) (b o c)*a=(b*a) o (c*a)

(d) a*b=a

1-d. An identity element of a group has ______ element. (CO2,K1) 1

(a) associative

.

(b) commutative

(c) inverse

(d) homomorphic

1-e. In which of the following relations every pair of elements is comparable. (CO3,K2) 1

(a) ≤

(b) !=

(c) >=

(d) ==

1-f. A ________ value is represented by a Boolean expression.(CO3,K1) 1

(a) Positive

(b) Recursive

(c) Negative

(d) Boolean

1-g. Let P: I am in Bangalore.; Q: I love cricket.; then q → p is : (CO4,K2) 1

(a) If I love cricket then I am in Bangalore

(b) If I am in Bangalore then I love cricket

(c) I am not in Bangalore

(d) I love cricket

1-h. A compound proposition that is neither a tautology nor a contradiction is called a ___________. (CO4,K1) 1

(a) Contingency

(b) Equivalence

(c) Condition

(d) Inference

1-i. A tree is a tree the vertices of which are assigned unique numbers from 1 to n.(CO5,K2) 1

(a) Bi-Centers

(b) Centers

(c) Unlabeled

(d) labeled

1-j. An important application of binary tree is. (CO5,K2) 1

(a) Huffman coding

(b) stack implementation

(c) queue implementation

(d) traverse a cyclic graph

2. Attempt all parts:-

2.a. Define reflexive relation. (CO1,K2) 2

2.b.	Show that, the set of all integers is a group with respect to addition.(CO2,K3)	2
2.c.	Define Boolean algebra.(CO3,K2)	2
2.d.	Use truth tables to verify the associative laws: $(p \lor q) \lor r \equiv p \lor (q \lor r)$. (CO4,K3)	2
2.e.	Explain in brief graph coloring with a suitable example.(CO5,K2)	2

SECTION-B 30

3. Answer any <u>five</u> of the following:-

3-a.	Prove that: $A \cap B = B \cap A$. (CO1,K3)	6
3-b.	Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the composition of f and g? What is the composition of g and f ? (CO1,K3)	6
3-c.	State and prove the Lagrange's Theorem. (CO2,K3)	6
3-d.	The set G = {0,1,2,3,4,5} is a group with respect to addition modulo 6. (CO2,K3)	6
3.e.	Define universal gate. Prove that NAND and NOR are universal gate.(CO3,K2)	6
3.f.	Explain Contradiction with example. Use a truth table to verify the first De Morgan law $\neg(p \land q) \equiv \neg p \lor \neg q$. (CO4,K3)	6
3.g.	Write short note on : a) Homomorphism of graphs b) Euler and Hamiltonian Paths (CO5,K2)	6

SECTION-C 50

4. Answer any <u>one</u> of the following:-

4-a.	State two ways to represent the relation with an example. Differentiate among symmetric, asymmetric and antisymmetric relation. (CO1,K2)	10
4-b.	Differentiate between complement and inverse of a relation. Give example using Venn diagram.(CO1,K4)	10

5. Answer any <u>one</u> of the following:-

5-a.	Explain Group with example. The set G = {1,2,3,4,5,6} is a group with respect to multiplication modulo 7. (CO2,K3)	10
5-b.	Explain Cyclic Group with suitable example. State and proof Lagrange's Theorem. (CO2,K3)	10

6. Answer any <u>one</u> of the following:-

6-a.	(i) Draw Hasse diagram for ({3, 4, 12, 24, 48, 72}, /) (ii) Draw Hasse diagram for $(D_{12}, /)$ (CO3,K3)	10
6-b.	Explain different types of lattice. Show that Lattice is modular, distributive but not complemented with example. (CO3,K2)	10

7. Answer any <u>one</u> of the following:-

7-a.	Use proof by contradiction to prove that the sum of an irrational number and a rational number is irrational. (CO4,K3)	10
7-b.	Show that each of these conditional statements is a tautology by using truth tables. (CO4,K3)	10

a) $(p \land q) \to p$,
b) $p \to (p \lor q)$,
c) $\neg p \to (p \to q)$,
d) $(p \land q) \to (p \to q)$,
e) $\neg(p \to q) \to p$

8. Answer any <u>one</u> of the following:-

8-a.	Define the edge connectivity and vertex connectivity of a graph. Prove that the vertex connectivity of any graph G never exceeds the edge connectivity of G (CO5,K3)	10
8-b.	Differentiate between Euler and Hamiltonian paths. Explain with the help of diagrams. (CO5,K4)	10

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