Printed Page:- 04 **Subject Code:- AMICSE0306**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech (Integrated)

SEM: III - THEORY EXAMINATION (2023 - 2024)

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. _____ is the multiplicative identity of natural numbers. (CO1) 1

(a) 0

(b) -1

(c) 1

(d) 2

1-b. If set A has 4 elements and B has 3 elements then set n(A X B) is : (CO1) 1

(a) 12

(b) 14

(c) 27

(d) 7

1-c. The set of odd and even positive integers closed under multiplication is _____. (CO2) 1

(a) a free semigroup of (M, ×)

(b) a subsemigroup of (M, ×)

(c) a semigroup of (M, ×)

(d) a subgroup of (M, ×)

1-d. Let '*' be a binary operation on N defined by a*b=a-b+ab2, then find 4*5. (CO2) 1

(a) 9

(b) 88

(c) 98

(d) 99

1-e. _____ are the is/are universal logic gates. (CO3) 1

(a) OR and NOR

(b) AND

(c) NAND and NOR

(d) NOT

1-f. The number of literals in the expression F=X.Y' + Z are___(CO3) 1

(a) 3

(b) 2

(c) 4

(d) 1

1-g. Let P: I am in Bangalore.; Q: I love cricket.; then $q \rightarrow p$ is : (CO4) 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. The premises $(p \wedge q) \vee r$ and $r \rightarrow s$ imply which of the conclusion : (CO4) 1

(a) p v q

(b) p v s

(c) $p \wedge q$

(d) q v r

1-i. In a graph if E=(u,v) means (CO5) 1

(a) u is adjacent to v but v is not adjacent to u

(b) e begins at u and ends at v

(c) u is processor and v is the successor

(d) both b and c

1-j. _____ is a discrete structure that represents hierarchical relationships between individual elements or nodes.(CO5) 1

(a) Tree

(b) Graph

(c) Root

(d) Vertices

2. Attempt all parts:-

2.a. List three operations possible on relations.(CO1) 2

2.b. Define rings and write it's properties. (CO2) 2

2.c. Prove that complement of an element is unique.(CO3) 2

2.d.	Define Proposition with an example. (CO4)	2
2.e.	Describe multigraph with example. (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	If A = {1, 5, 8, 9) and B {2, 4} and f={(1, 2), (5, 4), (8, 2), (9, 4)}. Then prove f is a onto function.(CO1)	6
3-b.	Let A = {1, 2, 3, 4}, give an example of a mapping which is (i) neither symmetric nor anti-symmetric, (ii) anti-symmetric and reflexive but not transitive, (iii) transitive and reflexive but not anti-symmetric.(CO1)	6
3-c.	Let G,G′ be groups. Suppose that we have a surjective group homomorphism f:G→G′. Show that if G is an abelian group, then so is G′.(CO2)	6
3-d.	Prove that the additive group Q=(Q,+) of rational numbers is not finitely generated. (CO2)	6
3.e.	Is there finite set such that it is a poset and totally ordered set but not a well-ordered set. Justify. (CO3)	6
3.f.	Describe all Quantifiers and explain with examples. (CO4)	6
3.g.	Explain complete graph and regular graph with an example. (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	State differences between 'Difference of sets' and 'Symmetric difference of sets'. Also give their examples individually.(CO1)	10
4-b.	Solve the recurrence relation 2ar-5ar-1+2ar-2 =0 then find the particular solution ao = 0 and a1 = 1. (CO1)	10

5. Answer any one of the following:-

5-a.	Let Q=(Q,+) be the additive group of rational numbers. (a) Prove that every finitely generated subgroup of (Q,+) is cyclic. (b) Prove that Q and Q×Q are not isomorphic as groups.(CO2)	10
5-b.	Prove Lagrange's theorem. (CO2)	10

6. Answer any one of the following:-

6-a.	Describe properties of lattices. (CO3)	10
6-b.	Describe distributive lattice in detail with an example. (CO3)	10

7. Answer any one of the following:-

7-a.	Draw the truth tables of AND, OR, NOT, NAND,NOR,XOR,XNOR gates. Mention which of them are universal gates. (CO4)	10
7-b.	Explain Tautology and Contradiction with definition and examples. (CO4)	10

8. Answer any one of the following:-

8-a.	Differentiate between Euler and Hamiltonian paths. Explain with the help of diagrams. (CO5)	10

8-b. Find a unique tree when these two traversals are given. Using the INORDER: H K D B I L E A F C M J G
PREORDER: A B D H K E I L C F G J M. (CO5) 10