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Subject Code:- AMCA0105

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM: I - CARRY OVER THEORY EXAMINATION - SEPTEMBER 2022

Subject: Discrete Mathematics

Time: 3 Hours

Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 marks each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. 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. Power set of empty set has exactly _____ subset. (CO1) 1

(a) One

(b) Two

(c) Zero

(d) Three

1-b. What is the cardinality of the set of odd positive integers less than 10? (CO1) 1

(a) 10

(b) 5

(c) 3

(d) 20

1-c. An edge with identical ends is called: (CO2) 1

(a) Loop

(b) Link

(c) Complete Graph

(d) Bipartite Graph

1-d. If R is reflexive, symmetric and transitive then the relation is said to be: (CO2) 1

(a) Binary Relation

(b) Equivalence Relation

(c) Irreflexive Relation

(d) Compatibility Relation

1-e. Condition for monoid is (CO3) 1

(a) (a+e)=a

(b) (a*e)=(a+e)

(c) a=(a*(a+e)

(d) (a*e)=(e*a)=a

1-f. Which of the following satisfies commutative law? (CO3) 1

(a) ∧

(b) v

(c) ↔

(d) All of the mentioned

1-g. Let P: I am in Bangalore.; Q: I love cricket.; then q -> p(q implies 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. Which of the following statement regarding sets is false? (CO4) 1

(a) $A \cap A = A$

(b) A U A = A

(c) $A - (B \cap C) = (A - B) \cup (A - C)$

(d) (A U B)' = A' U B'

1-i. Find the value of a_3 for the recurrence relation $a_n=5a_{n-1}+4$ with $a_0=1$ (CO5) 1

(a) 249

(b) 259

(c) 269

(d) 279

1-j. In how many ways 4 boys and 3 girls can be seated in a row so that they are alternate. (CO5) 1

(a) 144

(b) 288

(c) 12

(d) 256

2. Attempt all parts:-

2.a.	If U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} and A = {1, 3, 5, 7, 9, 10}. Find A′. (CO1)	2
2.b.	What is degree of a vertex? (CO2)	2
2.c.	Define Identity propery in group with an example. (CO3)	2
2.d.	If P is true and Q is false then find the truth value of $\neg P \rightarrow Q$. (CO4)	2
2.e.	Find the value of a_4 for the recurrence relation $a_n = 2a_{n-1} + 3$, with $a_0 = 2$. (CO5)	2

SECTION B 30

3. Answer any five of the following:-

3-a.	R and S are relation on A = { 1, 2, 3}, R = { (1,1), (1,2), (2,3), (3,1), (3,3) and S = {(1, 2), (1, 3), (2, 1), (3, 3)} then find RoS and SoR (CO1)	6
3-b.	Discuss the Symmetric and Asymmetric relation with an example. (CO1)	6
3-c.	Draw the Hasse diagram of the poset$(S, \leq)$ where $S = \{2, 3, 6, 9, 15, 27, 45\}$ and $X \leq Y$ if X divides Y. (CO2)	6
3-d.	Explain the method of representing graphs by using matrices? (CO2)	6
3.e.	Show that the set R = {0, 2, 4, 6} is a commutative ring under addition and multiplication modulo 8. (CO3)	6
3.f.	Make a truth table for the statement $(P \vee Q) \rightarrow (P \wedge Q)$. (CO4)	6
3.g.	Define Pigeon hole Principle with an example. (CO5)	6

SECTION C 50

4. Answer any one of the following:-

4-a.	Let V = {1, 2, 3, 4}, F = { (1,3), (2,1), (3,4), (4,3)} and G = { (1,2), (2,3), (3,1), (4,1)} find (I) FoG (II) GoF (III) FoF (CO1)	10
4-b.	In a class of 100 students, 43 play basketball and 37 play baseball. 9 students play both. How many students do not play either sport? (CO1)	10

5. Answer any one of the following:-

5-a.	Let X = {1, 2, 3, 4, 5, 6}, then / is a partial order relation on X. Draw the Hasse Diagram of (X, /). (CO2)	10

5-b. Draw the Hasse diagram of the poset$(S, \leq)$ where $S = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and $X \leq Y$ if X divides Y. (CO2) 10

6. Answer any one of the following:-

6-a. Prove that the set {0,1, 2, 3, 4, 5} for a finite abelian group under addition modulo 6. What will happen if the set is {1, 2, 3, 4, 5}? (CO3) 10

6-b. Find all generators of multiplicative group G = {1,-1, i,-i}. (CO3) 10

7. Answer any one of the following:-

7-a. Define quantifiers with an example. (CO4) 10

7-b. Verify whether the following two statements are logically equivalent or not $\neg(P \rightarrow Q)$ and $P \wedge \neg Q$. (CO4) 10

8. Answer any one of the following:-

8-a. Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2$ with initial condition $a_0 = 1$ and $a_1 = -1$. (CO5) 10

8-b. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed? (CO5) 10