NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - AUGUST 2023

Subject: Discrete Mathematics

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.　　　A _____ value is represented by a Boolean expression.　(CO1)　　　1

　　　　　(a) Positive

　　　　　(b) Recursive

　　　　　(c) Negative

　　　　　(d) Boolean

1-b.　　　What is the simplification value of MN(M + N') + M(N + N')?　(CO1)　　　1

　　　　　(a) M

　　　　　(b) MN+M'N'

　　　　　(c) (1+M)

　　　　　(d) M+N'

1-c.　　　If set C is {1, 2, 3, 4} and C – D = Φ then set D can be _____ .　(CO2)　　　1

　　　　　(a) {1, 2, 4, 5}

　　　　　(b) {1, 2, 3}

　　　　　(c) {1, 2, 3, 4, 5}

.

(d) None of the mentioned

1-d.   Let set A = {1, 2} and C be {3, 4} then A X B (Cartesian product of set A and B) is?   1
          (CO2)

          (a) {1, 2, 3, 4}

          (b) {(1, 3),(2, 4)}

          (c) {(1, 3), (2, 4), (1, 4), (2, 3)}

          (d) {(3, 1), (4, 1)}

1-e.   Find the number of words that can be formed using letters L,M,N and O?   1
          (CO3)

          (a) 296

          (b) 64

          (c) 1092

          (d) 1296

1-f.   How many ways are there to divide 4 Indian countries and 4 China countries   1
          into 4 groups of 2 each such that at least one group must have only Indian
          countries?   (CO3)

          (a) 6

          (b) 45

          (c) 32

          (d) 12

1-g.   G is a simple undirected graph and some vertices of G are of odd degree. Add a   1
          node n to G and make it adjacent to each odd degree vertex of G. The resultant
          graph is _____ (CO4)

          (a) Complete bipartite graph

          (b) Hamiltonian cycle

          (c) Regular graph

          (d) Eular graph

1-h.   A graph is _____ if and only if it does not contain a subgraph homeomorphic to   1
          k5 or k3,3. (CO4)

          (a) bipartite graph

          (b) planar graph

          (c) line graph

          (d) euler subgraph

1-i.   A compound proposition that is neither a tautology nor a contradiction is called   1
          .

a _____ (CO5)

      (a) Contingency

      (b) Equivalence

      (c) Condition

      (d) Inference

1-j. $(A \lor \neg A) \lor (q \lor T)$ is a ?   (CO5)   1

      (a) Tautology

      (b) Contradiction

      (c) Contingency

      (d) None of mentioned

2. Attempt all parts:-

2.a.   How do you draw Boolean expression from a logic circuit?   (CO1)   2

2.b.   Define Identity propery in group with an example. (CO2)   2

2.c.   In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women? (CO3)   2

2.d.   What are connected components in a graph? Illustrate with example. (CO4)   2

2.e.   Let R (x) denote the statement "x > 2." What is the truth value of the quantification $\exists x R(x)$, having domain as real numbers?   (CO5)   2

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SECTION B   30

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

3-a.   Draw a truth table for A+BC. (CO1)   6

3-b.   Simplify $Y = \bar{a}[(a + b) + (\bar{c} + \bar{c}b)] + c(\bar{a} + b) + a + \bar{b}$. (CO1)   6

3-c.   Show the set G = {0,1,2,3,4,5} is a group with respect to addition modulo 6. (CO2)   6

3-d.   Define Field and give an example. (CO2)   6

3.e.   Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 4$ with initial condition $a_0 = 1$ and $a_1 = -1$ (CO3)   6

3.f.   What is Diracs and Ores Theorem with respect to graph theory ?   (CO4)   6

3.g.   Define the conjunctive normal form with a suitable example in propositions. (CO5)   6

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SECTION C   50

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

4-a.	Evaluate the expression: (X + Z)(X + XZ') + XY + Y. (CO1)	10
4-b.	Given f(x,y,z) = (x̄+y)(z̄+x+ȳ) rewrite it so that it becomes an expression in which all three variables appear in each of the product terms. (CO1)	10

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

5-a.	In a group (G, *), Prove that (a * b)-1 = b-1 * a-1 for all a, b belongs G. (CO2)	10
5-b.	Show that {1,5,7,11} is a group under multiplication modulo 12. (CO2)	10

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

6-a.	A class contains 10 students with 6 men and 4 women. Find the number n of ways to: (a) Select a 4-member committee from the students. (b) Select a 4-member committee with 2 men and 2 women. (c) Elect a president, vice president, and treasurer. (CO3)	10
6-b.	Consider all positive integers with three different digits. (Note that zero cannot be the first digit.) Find the number of them which are: (a) greater than 700; (b) odd; (c) divisible by 5. (CO3)	10

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

7-a.	What is post order traversal in a tree. Explain with example. (CO4)	10
7-b.	What is five color theorem. Illustrate with example. (CO4)	10

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

8-a.	Determine whether each statement is true or false, and briefly explain your reasoning. (a) If an argument is valid then it is possible the conclusion to be false when all premises are true. (b) If the premises can't all be true, then the argument is valid. (c) If p ⇔ q and q ⇔ r, then p ⇔ r. (CO5)	10
8-b.	Do the following statements have the same meaning as the statement, "If Jean is not in her room, then she is at the library."? (i) If Jean is at the library, then she is not in her room. (ii) If Jean is at her room, then she is not at the library. (iii) If Jean is not at the library, then she is in her room. (iv) Jean is in her room, or she is at the library. Are the statements above related to each other? Explain. (CO5)	10