Printed Page:- **Subject Code:- ACSBS0106**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2022 - 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. _____ is used to implement the Boolean functions. (CO1) 1

(a) Logical notations

(b) Arithmetic logics

(c) Logic gates

(d) Expressions

1-b. _____ is a disjunctive normal form. (CO1) 1

(a) product-of-sums

(b) product-of-subtractions

(c) sum-of-products

(d) sum-of-subtractions

1-c. The intersection of the sets {1, 2, 5} and {1, 2, 6} is the set _____ ? (CO2) 1

(a) {1, 2}

(b) {5, 6}

(c) {2, 5}

(d) {1, 6}

1-d. If set A has 4 elements and B has 3 elements then set n(A X B) is? (CO2) 1

(a) 10

(b) 12

(c) 4

(d) 8

1-e. How many ways are there to arrange 7 chocolate biscuits and 12 cheesecake biscuits into a row of 19 biscuits? (CO3) 1

(a) 52347

(b) 50388

(c) 87658

(d) 24976

1-f. Determine the number of ways of selecting one or more letters from the letters BBBBBB? (CO3) 1

(a) 6

(b) 4

(c) 32

(d) 5

1-g. Every complete bipartite graph must not be _____ (CO4) 1

(a) planar graph

(b) line graph

(c) complete graph

(d) subgraph

1-h. How many perfect matchings are there in a complete graph of 10 vertices? (CO4) 1

(a) 10

(b) 945

(c) 230

(d) 220

1-i. The statement which is logically equivalent to A $\wedge$ (and) B is? (CO5) 1

(a) A->B

(b) ~A $\wedge$ ~ B

(c) A ∧ ~B

(d) ~(A->~B)

1-j. What are the inverse of the conditional statement " A positive integer is a composite only if it has divisors other than 1 and itself." (CO5) 1

(a) "A positive integer is a composite if it has divisors other than 1 and itself."

(b) "If a positive integer has no divisors other than 1 and itself, then it is not composite."

(c) "If a positive integer is not composite, then it has no divisors other than 1 and itself."

(d) None of the mentioned

2. Attempt all parts:-

2.a. Which gates are called as the universal gates? (CO1) 2

2.b. What is a transitive relation? Explain with example. (CO2) 2

2.c. Proof by contradiction that no integers x and y exist for which 18x+6y=1. (CO3) 2

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

2.e. Check the validity of the argument, "if today is Sunday, then yesterday was Saturday. Yesterday was Saturday. Today is Sunday." (CO5) 2

SECTION B **30**

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

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

3-b. Minimize the following Boolean function-F(A, B, C, D) = Σm(0, 1, 2, 5, 7, 8, 9, 10, 13, 15). (CO1) 6

3-c. Show that, the set of all integers is a group with respect to addition (Z, +). (CO2) 6

3-d. What is Lagarange's theorem? What are cosets? Explain using relevant examples. (CO2) 6

3.e. Prove: 1 + 4 + 7 +⋯+ 3n − 2 = n(3n−1) using Mathematical Induction. (CO3) 6

3.f. Discuss Konisberg Bridge problem. What was the solution for it? (CO4) 6

3.g. What are rule of inferences? State at least 5 rules with example. (CO5) 6

SECTION C **50**

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

4-a. Determine the minimum-cost SOP and POS expressions for the function f(x1, x2, x3, x4) = m(4, 6, 8, 10, 11, 12, 15) + D(3, 5, 7, 9). (CO1) 10

4-b. Simplify the function Y=A'B'C'+AB' C'+AB' C+ABC. (CO1) 10

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

5-a. Show that the set G = {1,2,3,4,5,6} is a group with respect to multiplication modulo. (CO2) 10

5-b. If (G, *) is a group and a belongs G such that a * a = a , then show that a = e , where e is identity element. (CO2) 10

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

6-a. There are 38 different time periods during which classes at a university can be scheduled. If there are 677 different classes, what is the minimum number of different rooms that will be needed? (CO3) 10

6-b. Find the number n of distinct permutations that can be formed from all the letters of each word:
(a) THOSE (b) UNUSUAL (c) SOCIOLOGICAL. (CO3) 10

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

7-a. What is BFS with respect to graph theory? What is the complexity of BFS? (CO4) 10

7-b. Explain and prove Eular formula for planarity of a graph. (CO4) 10

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

8 Three boxes are presented to you. One contains gold, the other two are empty. Each box has imprinted on it a clue as to its contents; the clues are: Box 1: “The gold is not here”, Box 2: “The gold is not here”, Box 3: “The gold is in Box 2.” Only one message is true; the other two are false. Which box has the gold? Formalize the puzzle in Propositional Logic and find the solution using a truth table. (CO5) 10

8 Write this English sentence in symbolic form-It is hot or else it is both cold and cloudy. Explain quantification with respect to predicates. (CO5) 10