Printed Page:- 04

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 (2023 - 2024)

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. Algebra of logic is termed as _____. (CO1) 1

(a) Numerical logic
(b) Boolean algebra
(c) Arithmetic logic
(d) Boolean number

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. What is the Cartesian product of A = {1, 2} and B = {a, b}? (CO2) 1

(a) {(1, a), (1, b), (2, a), (b, b)}
(b) {(1, 1), (2, 2), (a, a), (b, b)}
(c) {(1, a), (2, a), (1, b), (2, b)}
(d) {(1, 1), (a, a), (2, a), (1, b)}

1-d. Two sets are called disjoint if there _____ is the empty set. (CO2) 1

(a) Union
(b) Difference
(c) Intersection

(d) Complement

1-e. Find the number of ways of arranging the letters of the words DANGER, so that no vowel occupies odd place? (CO3) 1

(a) 22
(b) 121
(c) 144
(d) 234

1-f. There are six movie parts numbered from 1 to 6. Find the number of ways in which they be arranged so that part-1 and part-3 are never together ? (CO3) 1

(a) 340
(b) 480
(c) 520
(d) 800

1-g. What is the maximum number of edges in a bipartite graph on 14 vertices? (CO4) 1

(a) 43
(b) 44
(c) 45
(d) 49

1-h. All closed walks are of _____ length in a bipartite graph. (CO4) 1

(a) infinite
(b) even
(c) odd
(d) odd prime

1-i. Which of the following statement is a proposition? (CO5) 1

(a) Get me a glass of milkshake
(b) God bless you!
(c) What is the time now?
(d) The only odd prime number is 2

1-j. A compound proposition that is neither a tautology nor a contradiction is called a _____ (CO5) 1

(a) Contingency
(b) Equivalence
(c) Condition
(d) Inference

2. Attempt all parts:-

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

2.b. What are properties of abelian group ? (CO2) 2

2.c.	What is recurrence relation? (CO3)	2
2.d.	What are connected components in a graph? Illustrate with example. (CO4)	2
2.e.	Which rule of inference is used in each of these arguments, "If it is Wednesday, then the Smartmart will be crowded. It is Wednesday. Thus, the Smartmart is crowded." (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Draw a truth table for (A+B)(A+C). (CO1)	6
3-b.	Find the output sequence Y for an AND gate with inputs A, B, C (or equivalently for Y = ABC) where: (a) A = 111001;B = 100101;C = 110011. (b) A = 11111100;B = 10101010;C = 00111100. (c) A = 00111111;B = 11111100;C = 11000011. (CO1)	6
3-c.	Show that, the set of all integers is a group with respect to addition (Z, +). (CO2)	6
3-d.	Show the set G = {0,1,2,3,4,5} is a group with respect to addition modulo 6. (CO2)	6
3.e.	If Sn=4Sn-1+12n, where S0=6 and S1=7, find the solution for the recurrence relation. (CO3)	6
3.f.	Prove that a simple graph with n vertex and k components can have at most (n-k)(n-k+1)/2 edges. (CO4)	6
3.g.	A proof broken into distinct cases, where these cases cover all prospects, what are such proofs? Explain with suitable examples. (CO5)	6

SECTION-C 50

4. Answer any one 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.	Minimize F(A,B,C,D)=$\pi(3,5,7,8,10,13)$ using K-map. (CO1)	10

5. Answer any one of the following:-

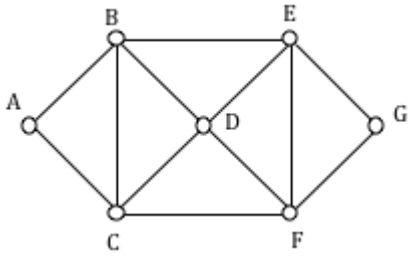
5-a.	What are sub-groups? Explain with example. (CO2)	10
5-b.	Show that G = {1, -1} is an abelian group under multiplication. (CO2)	10

6. Answer any one of the following:-

6-a.	Proof by mathematical induction that $(2 \cdot 7n + 3 \cdot 5n - 5)$ is divisible by 24 for all $n \in N$. (CO3)	10
6-b.	Prove that having 100 whole numbers, one can choose 15 of them so that the difference of any two is divisible by 7. (CO3)	10

7. Answer any one of the following:-

7-a.	Does the below graph contains Eular circuit? If yes, find one. What are the properties of Eular graph? (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. Write this English sentence in symbolic form-Either today is Sunday or Monday. 10
What do you mean by contingency and validity of a proposition? Explain with suitable examples. (CO5)

8-b. Using elementary mathematics, evaluate the truth values of the following 10
disjunctions:
(1) Five can be divided by one or five.
(2) The product of sixteen and four is sixty-four or the sum of sixteen and four is thirty.
(3) The difference between seven and four is greater than eight or the sum of seven and four is eleven.
(4) The number four is an odd number or $4 \div 12 = 4 + 12$. (CO5)