Printed Page:- Subject Code:- ACSBS0106

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow

B.Tech

SEM: I - THEORY EXAMINATION (2021 - 2022)

Subject: Discrete Mathematics

Time: 03:00 Hours Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- 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. The logic gate that provides high output for same inputs _____. (CO1) 1

1. NOT
2. X-NOR
3. AND
4. XOR

1-b. Simplify the expression XZ’ + (Y + Y’Z) + XY. (CO1) 1

1. (1+XY’)
2. YZ + XY’ + Z’
3. (X + Y +Z)
4. XY’+ Z’

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

1. {1, 2, 6, 1}
2. {1, 2, 5, 6}
3. {1, 2, 1, 2}
4. {1, 5, 6, 3}

1-d. For two sets C and D the set (C – D) ∩ D will be _____? (CO2) 1

1. C
2. D
3. Φ
4. None of the mentioned

1-e. In a colony, there are 55 members. Every member posts a greeting card to all the members. How many greeting cards were posted by them? (CO3) 1

1. 990
2. 890
3. 2970

4. 1980

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

1. 22
2. 121
3. 144
4. 234

1-g. In a complete bipartite graph, the intersection of two sub graphs is _____ (CO4) 1

1. NULL
2. 1
3. 412
4. 22

1-h. Which of the following graphs have Hamiltonian circuit? (CO4) 1

1. a complete graph of 5 vertices
2. a null graph
3. a graph with multiple edges
4. none of the options

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

1. Get me a glass of milkshake
2. God bless you!
3. What is the time now?
4. The only odd prime number is 2

1-j. Find the negation of the statement, “Match will be played only if it is not a humid day.” (CO5) 1

1. Match will be played but it is a humid day
2. Match will be played or it is a humid day
3. All of the mentioned statement are correct
4. None of mentioned

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

2.d. What is cut vertex 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 five of the following:-

3-a. Consider the following Boolean function-F(W, X, Y, Z) = $\sum$m(1, 3, 4, 6, 9, 11, 12, 14). Solve it using K-map. (CO1) 6

3-b. Draw the truth table of A'B'+AB. Find whether it is a tautology or contradiction? What is satisfiability and validity with respect to proposition? (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. Use generating function to solve the recurrence relation $a_n - 9a_{n-1} + 20a_{n-2}=0$ with $a_0 = -3$ and $a_1= -10$. (CO3) 6

3.f. Construct binary tree for the sequence : 10,12,5,4,20,8,7,15,13. Find in-order, post-order and pre-order traversal for this tree. (CO4) 6

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

SECTION C 50

4. Answer any one of the following:-

4-a. Minimize the following function in SOP minimal form using K-Maps: F(A, B, C, D) = m(1, 2, 6, 7, 8, 13, 14, 15) + d(3, 5, 12). (CO1) 10

4-b. Prove(A + B)(A + C) = A + BC using axioms of Boolean algebra as well as using Truth table. (CO1) 10

5. Answer any one of the following:-

5-a. In a group (G, *) ,Prove that the inverse of any element is unique. (CO2) 10

5-b. Show that G = {1, -1} is an abelian group under multiplication. (CO2) 10

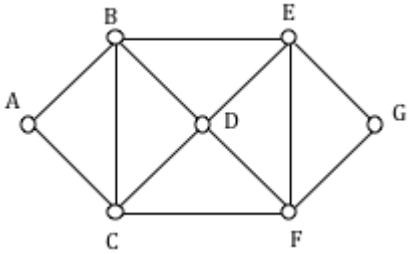
6. Answer any one of the following:-

6-a. Using the principle of mathematical induction, prove that n(n + 1)(n + 5) is a multiple of 3. (CO3) 10

6-b. 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

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. Graph G is obtained by adding vertex s to $K_{3,4}$ and making s adjacent to every vertex of $K_{3,4}$. Find the chromatic number of this graph. (CO4) 10

8. Answer any one of the following:-

8-a. Verify the following proposition with help of the truth table: P v (~P ^ Q) = P v Q. (CO5) 10

8-b. Formalize the following arguments and verify whether they are correct: “If you play and you study you’ll pass the exams, while if you play and don’t study you won’t pass. Thus, if you play, either you study and you’ll pass the exams, or you don’t study and you won’t pass.” (CO5) 10