Printed Page:-04 **Subject Code:- BCSBS0106**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2024 - 2025)

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. Inversion of single bit input to a single bit output using _____. (CO1,K1) 1

(a) NOT
(b) AND
(c) OR
(d) NAND

1-b. Identify the use of Boolean identities? (CO1,K1) 1

(a) Minimizing the Boolean expression
(b) Maximizing the Boolean expression
(c) To evaluate a logical identity
(d) Searching of an algebraic expression

1-c. Which of the following two sets are disjoint? (CO2,K2) 1

(a) {1, 3, 5} and {1, 3, 6}
(b) {1, 2, 3} and {1, 2, 3}
(c) {1, 3, 5} and {2, 3, 4}
(d) {1, 3, 5} and {2, 4, 6}

1-d. Find the cardinality of the Power set of the set {0, 1, 2}? (CO2,K2) 1

(a) 8
(b) 5

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(c) 2

(d) 4

1-e. There are 15 people in a committee. How many ways are there to group these 15 people into 3, 5, and 4? (CO3,K5) 1

(a) 846

(b) 2468

(c) 658

(d) 1317

1-f. If 16Pr-1 : 15Pr-1 = 16 : 7 then find r ? (CO3,K2) 1

(a) 10

(b) 11

(c) 2

(d) 12

1-g. A _____ in a graph G is a circuit which consists of every vertex (except first/last vertex) of G exactly once. (CO4,K1) 1

(a) Euler path

(b) Hamiltonian path

(c) Planar graph

(d) Path complement graph

1-h. In a _____ the degree of each and every vertex is equal. (CO4,K1) 1

(a) regular graph

(b) point graph

(c) star graph

(d) euler graph

1-i. A compound proposition that is neither a tautology nor a contradiction is called a _____ (CO5,K1) 1

(a) Contingency

(b) Equivalence

(c) Condition

(d) Inference

1-j. Find the negation of the statement, “Match will be played only if it is not a humid day.” (CO5,K2) 1

(a) Match will be played but it is a humid day

(b) Match will be played or it is a humid day

(c) All of the mentioned statement are correct

(d) None of mentioned

2. Attempt all parts:-

2.a. Test for tautology, $[(p \wedge q) \rightarrow r] \rightarrow [p \rightarrow (q \rightarrow r)]$. (CO1,K5) 2

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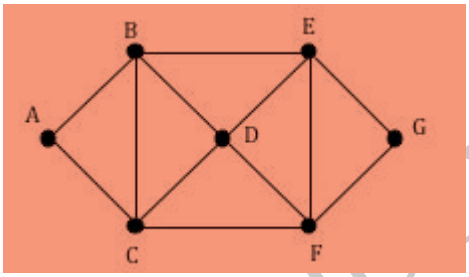
2.b.	If f: R → R is defined by f(x) = 5x + 3, find f(2). (CO2,K2)	2
2.c.	In a group of 7 boys and 5 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? (CO3,K4)	2
2.d.	Define complete graph by illustrating with an example. (CO4, K1,K4)	2
2.e.	Find the inverse of the conditional statement "If you make your notes, it will be a convenient in exams." (CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Verify that (X + Y)(X + Z)(Y + Z) = (X + Y)(X + Z). (CO1,K4)	6
3-b.	List the connectives and write their truth table. (CO1,K1,K6)	6
3-c.	Let functions f, g, h from V = {1, 2, 3, 4} into V be defined by: f (n) = 6 − n, g(n) = 3, h = {(1, 2), (2, 3), (3, 4), (4, 1)}. Decide which functions are: (a) one-to-one; (b) onto; (c) both; (d) neither. (CO2,K4)	6
3-d.	How many properties can be held by a abelian group? (CO2,K3)	6
3.e.	A debating team consists of 3 boys and 3 girls. Find the number of ways they can sit in a row where: (a) there are no restrictions; (b) the boys and girls are each to sit together; (c) just the girls are to sit together. (CO3,K2)	6
3.f.	Find the Eular path, if exist in the graph shown? (CO4,K2)	6



3.g.	Explain the Quantifiers and their types? (CO5,K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Evaluate the expression: (X + Z)(X + XZ') + XY + Y. (CO1,K4)	10
4-b.	Minimize F(A,B,C,D)=π(3,5,7,8,10,11,12,13). (CO1,K6)	10

5. Answer any one of the following:-

5-a.	Find the order of an element of a group? Explain with example. (CO2,K2)	10
5-b.	If (G, *) is a group and 'a' belongs to G such that a * a = a , then show that a = e , where e is an identity element. (CO2,K3)	10

6. Answer any one of the following:-

6-a.	A proof that p → q is true based on the fact that q is true. Explain	10

which laws of logic is used to verify this. (CO3,K2)

6-b. Explain non-homogeneous recurrence relations with examples. (CO3,K2) 10

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

7-a. Explain and prove Eular's formula for planarity of a graph. (CO4,K2,K4) 10

7-b. Define BFS with respect to graph theory by illustrating with example. What is the complexity of BFS? (CO4,K1,K5) 10

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

8-a. Use the truth tables method to determine whether $(\neg p \vee q) \wedge (q \rightarrow \neg r \wedge \neg p) \wedge (p \vee r)$ is satisfiable. (CO5,K3) 10

8-b. Prove that for any three propositions P,Q,R the compound proposition $(P \rightarrow Q (\rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$ is a tautology by
i) truth table ii) laws of logic. (CO5,K5) 10