

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - MAY 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. Minimization of function $F(A,B,C) = A*B*(B+C)$ is _____. (CO1) 1

(a) AC

(b) B+C

(c) B'

(d) AB

1-b. Evaluate the expression: $(X + Z)(X + XZ') + XY + Y$. (CO1) 1

(a) $XY+Z'$

(b) $Y+XZ'+Y'Z$

(c) $X'Z+Y$

(d) $X+Y$

1-c. Let C and D be two sets then $C - D$ is equivalent to _____. (CO2) 1

(a) $C' \cap D$

(b) $C' \cap D'$

(c) $C \cap D'$

(d) None of the mentioned

- 1-d. Which of the following statement regarding sets is false? (CO2) 1
- (a) $A \cap A = A$
 - (b) $A \cup A = A$
 - (c) $A - (B \cap C) = (A - B) \cup (A - C)$
 - (d) $(A \cup B)' = A' \cup B'$
- 1-e. 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-f. Find the number of ways in which 4 people E, F, G, H, A, C can be seated at a round table, such that E and F must always sit together. (CO3) 1
- (a) 48
 - (b) 62
 - (c) 120
 - (d) 50
- 1-g. Every Isomorphic graph must have _____ representation. (CO4) 1
- (a) cyclic
 - (b) adjacency list
 - (c) tree
 - (d) adjacency matrix
- 1-h. What we call as degree of a vertex in a graph? (CO4) 1
- (a) total edges incident on vertex
 - (b) total weights incident on vertex
 - (c) total loops on a vertex
 - (d) total multiple edges
- 1-i. The compound statement $A \rightarrow (A \rightarrow B)$ is false, then the truth values of A, B are respectively _____ (CO5) 1
- (a) T, T
 - (b) F, T
 - (c) T, F

(d) F, F

- 1-j. What are the contrapositive of the conditional statement "I come to class whenever there is going to be a test." (CO5) 1
- (a) "If I come to class, then there will be a test."
(b) "If I do not come to class, then there will not be a test."
(c) "If there is not going to be a test, then I don't come to class."
(d) "If there is going to be a test, then I don't come to class."

2. Attempt all parts:-

- 2.a. Use a Venn diagram to verify 2
- (a) $A + AB = A + B$
(b) $AB + AC + BC = AB + AC$ (CO1)
- 2.b. Define a Null Set with an example. (CO2) 2
- 2.c. What are generating functions? (CO3) 2
- 2.d. What do you mean by pendant vertex 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. List the connectives and write their truth table. (CO1) 6
- 3-b. Plot the following Boolean expression on Karnaugh maps (K-maps): $x\bar{y} + \bar{x}y + xy$ (CO1) 6
- 3-c. Prove that $A \cup B = B \cup A$. (CO2) 6
- 3-d. Write some examples of onto function. (CO2) 6
- 3.e. Find the unique solution with initial conditions given: $a_n = 9a_{n-1} - 27a_{n-2} + 27a_{n-3}$ with $a_0 = 5, a_1 = 24, a_2 = 117$. (CO3) 6
- 3.f. Draw binary search tree with elements 30,35,20,15,25,18,5,45,50,60. (CO4) 6
- 3.g. Prove by mathematical induction that, for all positive integral values of n , $(1/1.3) + (1/3.5) + (1/5.7) + \dots + [1 / \{(2n - 1)(2n + 1)\}] = [n / (2n + 1)]$. (CO5) 6

SECTION C

50

4. Answer any one of the following:-

- 4-a. Minimize the following problems using the Karnaugh maps method- $Z = f(A,B,C)$ 10
 $= A + B + AB + AC$. (CO1)

- 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. If every element of a group is its own inverse, then show that the group must be abelian. (CO2) 10
- 5-b. Determine which of the following sets are finite: 10
 (a) Lines parallel to the x axis. (c) Integers which are multiples of 5.
 (b) Letters in the English alphabet. (d) Animals living on the earth.(CO2)
- 6. Answer any one of the following:-**
- 6-a. If a Martian has an infinite number of red, blue, yellow, and black socks in a drawer, how many socks must the Martian pull out of the drawer to guarantee he has a pair? (CO3) 10
- 6-b. Suppose 32 students are in an art class A and 24 students are in a biology class B, and suppose 10 students are in both classes. Find the number of students who are: (a) in class A or in class B; (b) only in class A; (c) only in class B. (CO3) 10
- 7. Answer any one of the following:-**
- 7-a. What is preorder traversal in a tree.Explain with example. (CO4) 10
- 7-b. Explain various operations of graphs with example. (CO4) 10
- 8. Answer any one of the following:-**
- 8-a. Show that $[(p \vee q) \wedge (r \vee \neg q)] \rightarrow (p \vee r)$ is a tautology by making a truth table, and then again by using an argument that considers the two cases “q is true” and “q is false” . (CO5) 10
- 8-b. Construct truth tables for the following statements. 10
 (1) $(a \rightarrow b) \wedge (\sim b \rightarrow \sim a)$ (2) $\sim (a \vee b) \vee \sim (a \wedge b)$ (CO5)