

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM

II B. Tech I Semester Regular Examinations, November – 2024

Discrete Mathematics & Graph Theory

(Common to CSE(AI&ML, DS, AI&DS, CS,), AI&DS, AI&ML)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A, Part B.**Part A is compulsory, Answer all questions.**In Part B, Answer any one question from each unit.*

PART-A**(20 Marks)**

- 1 a) Write the truth value of proposition if the statement is proposition $x + 2 = 3$ [2]
- b) Find the contrapositive of “The home team wins whenever it is raining.” [2]
- c) Let $P(x)$ be the statement “ x spends more than five hours every weekday in class,” where the domain for x consists of all students. Express this statement using notation [2]
- d) Translate in two ways each of these statements into logical expressions using predicates, quantifiers, and logical connectives [2]
“Someone in your class can speak Hindi
- e) How many bit strings of length 8 contain exactly five 1s [2]
- f) If $f: R \rightarrow R$ such that $f(x) = \sqrt{x}$ is a function [2]
- g) Find the generators on set of all cube roots of unity under multiplication [2]
- h) Find the identity element in $(Z, +)$ [2]
- i) Set up a recurrence relation for “The number of bacteria in culture Triple in every hour” [2]
- j) Verify whether $a_n = 2^n$ is a solution for the recurrence relation $a_n = 8a_{n-1} - 16a_{n-2}$ [2]

PART-B**(50 Marks)****Unit-1**

- 2 a) Verify whether the relation is logically equivalent $p \rightarrow (q \rightarrow p) \Leftrightarrow p \rightarrow (p \rightarrow q)$ [5]
- b) Test the validity of the following arguments: [5]
 - (i) Sone is watching a TV
 - (ii) If sone is watching TV, then she is not studying.
 - (iii) If she is not studying, then her father will not buy her a scooty.

Therefore, sone’s father will not buy a scooty.

(OR)

- 3 a) Obtain PCNF for $(\sim p \rightarrow r) \wedge (q \leftrightarrow p)$ [5]
- b) Verify whether: $\{(p \vee q) \wedge r\} \rightarrow (p \vee r)$ is a tautology [5]

Unit-2

- 4 Write the following sentences in the symbolic form [10]
 - i. some people who trust others are rewarded.
 - ii. If anyone is good, john is good.
 - iii. He is ambitious or no one is ambitious
 - iv. Someone is dancing
 - v. It is not true all roads lead to Rome

- (OR)
- 5 Establish the validity of the following arguments [10]
- i. Every living thing is a plant or an animal
 - ii. Joe's goldfish is alive, and it is not a plant.
 - iii. All animals have hearts.

Therefore, Joe's goldfish has heart.

Unit-3

- 6 a) How many solutions does the equation $x + y + z = 11$ have, whether x, y and z are non-negative integers [5]
- b) Determine the number of primes not exceeding 100 and not divisible by 2, 3, 5 or 7. [5]

(OR)

- 7 a) Verify whether $(S_{42}, /)$ is lattice where $S_{42} = \{1, 2, 3, 6, 7, 14, 21, 42\}$ [5]
- b) Determine whether $R = \{(1, 2), (1, 4), (2, 1), (2, 3), (2, 4), (3, 2), (4, 1), (4, 2)\}$ is an equivalence relation [5]

Unit-4

- 8 a) Find the left and right cosets of $5Z$ determined by 1, 2, 3 where $(5Z, +)$ is a subgroup of $(Z, +)$ [5]
- b) Prove that the union of two sub groups of group G need not be a subgroup [5]

(OR)

- 9 Let R be a set of real numbers then Verify whether $(R, *)$ be a group where * is defined as $a * b = a + b + 1$ [10]

Unit-5

- 10 a) Using iterative approach solve the recurrence relation [5]
 $a_n = 3a_{n-1}, a_0 = 2$
- b) Solve the recurrence relation using generating function approach [5]
 $a_n = 2a_{n-1} + 3a_{n-2}, a_0 = 3, a_1 = 1$
- (OR)
- 11 a) Solve the recurrence relation $a_n = a_{n-1} + a_{n-2}, a_0 = 0, a_1 = 1$ [5]
- b) Solve the recurrence relation $a_n = 7a_{n-1} - 10a_{n-2} + 8n + 6$ [5]
 $a_0 = 1, a_1 = 2$
