



End Term (Odd) Semester Examination December 2024

Roll no. XXXXXXXXXX

Name of the Course and semester: B.Tech. III semester

Name of the Paper: Discrete Structure and Combinatorics

Paper Code: TMA-316

Time: 3 hour

Maximum Marks: 100

Note:

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

Q1.

(2X10=20 Marks)

- a. Draw the Hasse diagram of Poset $(P(A), \subseteq)$, where $A = \{a, b, c\}$. Find greatest element, least element, minimal element and maximal element. CO1
- b. Prove that if R is an equivalence relation on set A then R^{-1} is also an equivalence relation on set A . CO1

- c. Define the following with examples: (i) Bijective function (ii) Many one function (iii) Invertible function (iv) Identity function. CO1

Q2.

(2X10=20 Marks)

- a. A die is thrown 8 times and it is required to find the probability that 3 will show (i) Exactly 2 times (ii) At least six times (iii) At most three times. CO2
- b. Define the following: (i) Normal distribution (ii) Random variables (iii) Exponential distribution (iv) Bayes theorem. CO2
- c. If mean and variance of a binomial distribution are 4 and 2 respectively, find the probability of (i) exactly 2 successes (ii) less than 3 successes (iii) at least 4 successes. CO2

Q3.

(2X10=20 Marks)

- a. Define the following with suitable examples:
 - (i) Quantifiers
 - (ii) Tautologies
 - (iii) Logical equivalence
 CO3
- b. Show that (i) $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$ CO3
 (ii) $\neg(p \leftrightarrow q) \equiv (p \vee q) \wedge \neg(p \wedge q)$.
- c. Using Principle of Mathematical induction proves that $(n^5 - n)$ is divisible by 5. CO3



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- Q4. (2X10=20 Marks)
- a. Prove that the fourth root of unity $\{1, -1, i, -i\}$ form an abelian group with respect to multiplication. CO4
- b. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girls? (ii) at least one boy and one girl? (iii) at least 3 girls? CO4
- c. Define the following (i) Abelian group (ii) Pigeonhole principle (iii) Isomorphism. CO4
- Q5. (2X10=20 Marks)
- a. (i) State and prove Handshaking theorem. CO5
(ii) Explain Adjacency matrix.
- b. Define the following: (i) Directed graph (ii) Connected graph (iii) Complete graph (iv) Hamilton path. CO5
- c. Draw the following graphs: (i) $K_{3,4}$ (ii) W_6 (iii) K_5 (iv) C_6 . CO5