



## End Term (Odd) Semester Examination December 2024

Roll no.....

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)  $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$

(ii)  $\neg(p \leftrightarrow q) \equiv (p \vee q) \wedge \neg(p \wedge q)$ . CO3

b. Using Principle of Mathematical induction proves that  $(n^5 - n)$  is divisible by 5. CO3





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Q4.

a. Prove that the fourth root of unity  $\{1, -1, i, -i\}$  form an abelian group with respect to multiplication. (2X10=20 Marks)

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.

a. (i) State and prove Handshaking theorem.

(2X10=20 Marks)

(ii) Explain Adjacency matrix.

CO5

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