A-0878

Total Pages : 5 **Roll No. ----------**

MCS-501

Discrete Mathematics

(MCA/MSCIT)

1st / 3rd Semester Examination 2024(Dec.)

Time: 2:00 hrs Max. Marks: 70

Note : This paper is of Seventy (70) marks divided into Two (02) Section A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

P.T.O.

Section-A (Long-Answer-Type Questions)

Note : Section 'A' contains Five (05) long-answer-type questions of Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

[2x19=38]

Q.1. A) Define the following relation with the help of suitable examples:

i. Symmetric relation

ii. Transitive relation

iii. Irreflexive relation

iv. Antisymmetric relation[10]

B) Define the following terms with the help of suitable examples:

i. One-One function

ii. Many one function

iii. Recursively defined function [9]

Q.2. A) Define a preposition. Write propositions for the following sentences:

i. If I go to market, then I buy sweets.

ii. I play chess or I sing songs.

iii. I do not watch movie but I play cricket

iv. Neither I play football nor I play cricket. [10]

B) Describe conjunctive and disjunctive normal forms with the help of suitable examples.[9]

Q.3. A) Explain direct method of proof. Using direct method, prove that the square of an even number is an even number. [10]

B) Using mathematical induction to prove that for every integer $n > 0, x^{n-1} - 1$ is divisible by $x - 1$ [9]

Q.4. A) Using the principle of mathematical induction prove that [10]

$1 + 2 + 2^2 + ... + 2^n = 2^{n+1} - 1$

B) Solve the following recurrence relation

$a_r + 2a_{r-1} - 3a_{r-2} = 2^r$ [9]

Q.5. A) State and prove Lagrange theorem. [10]

B) Define a Ring with suitable example. [9]

Section-B (Short-Answer-Type Questions)

Note : Section 'B' contains Eight (08) short-answer-type questions of Eight (08) marks each. Learners are required to answer any Four (04) questions only. [4x8=32]

Q.1. Define a Tree. Prove that there are n-1 edges in a tree with n vertices.

Q.2. Define Complete and Regular graphs with suitable examples.

Q.3. Define Chomsky Hierarchy.

Q.4. Define deterministic finite automation. Let $\sum$ = {a, b}, then design a DFA that accepts all the strings that starts with ab.

Q.5. Prove that the order of a cyclic group is equal to the order of its generator.

Q.6. Prove that the fourth roots of unity 1, -1, i, -i form an abelian multiplicative group.

Q.7. Find the number of ways a three-digit number can be formed using the digits of the set {1, 2, 3, 4} if

i. repetition is allowed.

ii. repetition is not allowed.

iii. the number is even and repetition is not allowed.

iv. the number is even and repetition is allowed.

Q.8. Define difference and symmetric difference of two sets with the help of suitable examples.

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