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Roll No. :

MCA-09/M.Sc.IT-09

Discrete Mathematics

Master of Computer Application/Master of Science in

Information Technology

(MCA/M.Sc.IT-11/12/16/17)

3rd Semester Examination June 2022

Time : 2 Hours

Max. Marks : 80

Note : This Paper is of Eighty (80) marks divided into two (02) Section A and B. Attempt the questions contained in these sections according to the detailed instructions given there in.

Section-A

(Long Answer-type questions)

Note: Section 'A' contains Five (05) Long-answer type questions of Twenty (20) marks each. Learners are required to answer any two (02) questions only.

(2 x 20 = 40)

- Q.1. A. Let x , y and z be three sets. Prove that
 $(x - y) - z = (x - z) - (y - z)$
- B. Define one-one and onto functions.

P.T.O.

- Q.2 Define a preposition and the connectives:
disjunction, conjunction, conditional and bi-conditional.
- Q.3 A. Define pigeonhole principle. Find the minimum number of students in a class to be sure that 6 of them were born in the same month.
- B. Define permutation and combination with the help of suitable examples.
- Q.4 Define group and subgroup. Prove that a non empty subset H of a group G is a subgroup of G if
 $a, b \in H \Rightarrow ab^{-1} \in H$
- Q.5 Define the following terms :
- i. Euler graph ii. Hamiltonian circuit
iii. Planar graph iv. Bipartite graph v. Tree

Section-B

(Short Answer-type questions)

Note: Section 'B' contains Eight (08) Short-answer type questions of ten (10) marks each. Learners are required to answer any four (04) questions.

(4 x 10 = 40)

P.T.O.

- Q.1 If R and S are equivalence relations on a set x, Show $R \wedge S$ is also an equivalence relation on x.
- Q.2 Define invertible functions. Let $f: z \rightarrow z$ be a function defined as $f(x) = 2x + 1$. Determine whether the function is invertible or not. Give justification for your answer.
- Q.3. Define disjunctive normal form. Find the disjunctive normal form of
 $(\sim P \wedge Q) \wedge (P \rightarrow Q)$
- Q.4. Write predicates for the following sentences:
(i) All students are tall.
(ii) Some cats are black.
- Q.5(A) How many 4 digit numbers can be formed using the digits of the set $x = \{1, 2, 3, 4, 5, 6\}$ if repetition is not allowed.
- (B) How many ways are there to select a committee of three students from a group of 3 boys and 4 girls if the committee contains 1 boy and 2 girls.
- Q.6. Show that the set $G = \{1, -1, i, -i\}$ is a group with respect to usual multiplication.

P.T.O.

Q.7. Define a partial order relation. Draw the Hasse diagram of $(\mathcal{P}(x), \subseteq)$, where $x = \{1, 2, 3\}$ and $\mathcal{P}(x)$ is the power set of x .

Q.8. Find the minimal spanning tree using Kruskal's algorithm for the graph given below:


