Roll No.

MCA-09/M. Sc. IT-09

Discrete Mathematics

Master of Computer Application/Master of Science in Information Technology (MCA–16/MCA–11/M.Sc. IT-16/M.Sc. IT–12) Third Semester, Examination, 2017

Time : 3 Hours

Max. Marks : 60

Note: This paper is of sixty (60) marks containing three (03) sections A, B, and C. Attempt the questions contained in these sections according to the detailed instructions given therein.

Section-A

(Long Answer Type Questions)

- **Note :** Section 'A' contains four (04) long answer type questions of fifteen (15) marks each. Learners are required to answer *two* (02) questions only.
- 1. Explain principle of mathematical induction. Prove the inequality $n < 2^n \forall$ positive integer *n*. (Use principle of math induction.)
- 2. (a) State and prove De Morgan's laws.
 - (b) Explain Prim's algorithm.
- 3. (a) Use generating function to solve the recurrence relation $a_n + 3a_{n-1} 4a_{n-2} = 0$, $n \ge 2$, with initial condition $a_0 = 3$, $a_1 = 2$.

- (b) Write and explain set, types of set, relation and types of relation with example of each.
- 4. If R is a ring such that $a^2 \Rightarrow a \forall a, b \in \mathbb{R}$, prove that :
 - (a) $a + b = 0, a \Rightarrow b$
 - (b) R is commutative ring

Section-B

(Short Answer Type Questions)

- **Note :** Section 'B' contains eight (08) short answer type questions of five (5) marks each. Learners are required to answer *four* (04) questions only.
- 1. Explain permutation and combination with an example of each.
- 2. How many paths of length four are there from *a* to *d* in a simple graph G ?



- 3. Write and explain the condition of tautology, and contradiction with example. Use your own data to prove.
- 4. Define bipartite graph.
- 5. Prove that $\sqrt{2}$ is irrational by giving proof by contradiction.

- 6. Prove that in a finite group, order of any subgroup devices the order of the group.
- 7. Show that a tree with a *n* vertices $h_{af}(n-1)$ edges.
- 8. When a lattice is called complete ?

Section-C

(Objective Type Questions)

- **Note :** Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this section are compulsory.
- 1. Find truth table $P \rightarrow Q$.
- 2. In how many ways can all the letter in AMERICA be arranged ?
- 3. What is Cyclic Group ?
- 4. Explain Graph.
- 5. What is Hamiltonian Graph?
- 6. What is Function ?
- 7. Explain tautology with example.
- 8. Draw truth table of A + B'C + A.B.C.
- 9. What is minimum spanning tree ?
- 10. Define group and semi-group.

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