S-129 Roll No. ……..

MCA–09/M. Sc.-IT–09

Discrete Mathematics

Master of Computer Applications/

Master of Science in Information Technology

(MCA/M.Sc.-IT–11/12/16/17)

Third Semester, Examination, 2018

Time : 3 Hours **Max. Marks : 80**

Note : This paper is of **eighty (80)** 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 nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. (a) What are the properties of equivalence relation ? 5

   (b) What is transitive relation ? Give example. 5

   (c) Define complete graph with the help of an example. 5

   (d) Explain the different types of relation. 4

2. (a) Define the following terms with the help of suitable examples : 3 each

   (i) Tautology

   (ii) Contradiction

   (iii) Well formed formula

   (iv) Conjunctive normal form

   (b) Check whether the compound propositions $(P \rightarrow R) \wedge (Q \rightarrow R)$ and $(P \vee Q) \rightarrow R$ are equivalent. 7

3. (a) Write the predicates for the following sentences : 3 each

   (i) All boys are tall.

   (ii) Some advocates are clever.

   (iii) All doctors are not healthy.

   (iv) Some animals are not cats.

   (b) Define a group with the help of a suitable example. 7

4. (a) Define the following terms with the help of suitable examples : 3 each

   (i) Walk and path

   (ii) Regular graph

   (iii) Complete graph

   (iv) Planar graph

   (b) Discuss minimal spanning tree in a graph an algorithm to find minimal spanning tree in a graph. 7

Section–B

(Short Answer Type Questions)

Note : Section 'B' contains eight (08) short answer type questions of eight (8) marks each. Learners are required to answer *four* (04) questions only.

1. Draw the Venn diagram of the following sets :

   (i) $A \cup B \cup C$

   (ii) $A \cap B \cap C$

   (iii) $(A \cup B) - C$

   (iv) $(A \cup B \cup C)'$

2. (i) Define symmetric relation with the help of suitable examples.

   (ii) Let $f : R \to R$ defined as $f(x) = 2x + 5$, find the inverse of f.

3. Let :

   P : Hari is reading.

   Q : Mukesh is walking.

   R : Rita is playing.

   Write propositions for the following sentences :

   (a) Hari is reading and Mukesh is walking.

   (b) Mukesh is not walking or Rita is not playing.

   (c) Hari is not reading and Mukesh is walking.

   (d) Hari is not reading and Rita is not playing.

   (e) If Rita is playing, then Hari is not reading.

   (f) If Hari is not reading, then Mukesh is not walking.

(g) If Rita is playing and Mukesh is walking, then Hari is not reading.

(h) If Mukesh is walking or Hari is reading, then Rita is not playing.

4. Define permutation and combinations with the help of suitable examples.

5. (i) Define a subgroup.

   (ii) Define group homomorphism.

6. (i) Define a partially ordered set.

   (ii) Define a lattice.

7. (i) Define a simple graph.

   (ii) A graph has 10 edges, two vertices of degree 3, three vertices of degree 4 and other vertices of degree 2. Find the number of vertices in the graph.

8. Discuss 'depth first traversal' and 'breadth first traversal'.

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. The number of subsets of a set with 4 elements are :

   (a) 4

   (b) 8

   (c) 15

   (d) 16

2. $\overline{A \cup B} =$

(a) $\overline{A} \cup \overline{B}$

(b) $\overline{A} \cap \overline{B}$

(c) $A \cap B$

(d) None of these

3. Let X = {*a*, *b*, *c*}. Which of the following is a reflexive relation ?

(a) {(*a*, *a*), (*b*, *b*), (*a*, *c*)}

(b) {(*b*, *b*), (*c*, *c*), (*a*, *a*)}

(c) {(*b*, *b*), (*a*, *a*), (*c*, *b*)}

(d) {(*a*, *c*), (*a*, *a*), (*c*, *c*)}

4. A function is invertible if it is :

(a) One-One onto

(b) Many-One onto

(c) One-One only

(d) No condition required

5. The proposition $\sim (P \rightarrow Q)$ is equivalent to :

(a) $\sim P \vee Q$

(b) $P \vee \sim Q$

(c) $\sim P \wedge Q$

(d) $P \wedge \sim Q$

6. Which of the following is a contradiction ?

(a) $\sim P \vee Q$

(b) $P \vee \sim Q$

(c) $\sim P \wedge Q$

(d) $P \wedge \sim P$

7. A relation is said to be 'Partial Order Relation' if it is :
   (a) Reflexive, Symmetric and Transitive
   (b) Reflexive, Asymmetric and Transitive
   (c) Reflexive, Antisymmetric and Transitive
   (d) Irreflexive, Symmetric and Transitive

8. The value of ${}^{5}C_{2}$:
   (a) 60
   (b) 20
   (c) 10
   (d) None of these

9. Which of the following property is not required for an algebraic structure to be a group ?
   (a) Closure property
   (b) Existence of identity element
   (c) Distributive law
   (d) Associative law

10. A tree with 10 vertices has ..... edges.
   (a) 10
   (b) 9
   (c) 8
   (d) Cannot be determined