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.
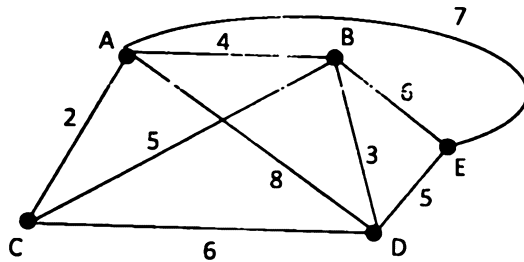
Section–A

(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)　Define a power set. Write power set of the set X = {*a, b, c*}.　　　　6

　　(b)　Define an equivalence relation.　　　6

　　(c)　Define one-one and onto functions with the help of suitable examples.　　　7

2.　(a)　Define Tautology and Contradiction with the help of suitable examples.　　　6

(b) Define an argument. Show that the argument $p, p \rightarrow q; q$ is a valid argument. 6

(c) Define permutations and combinations. Show that $P(n, r) = r! C(n, r).$ 7

3. (a) Define a group. Give a suitable example. 6

(b) Define partially ordered set with the help of a suitable example. 6

(c) Find the minimal spanning tree using Prim's algorithm in the graph shown below : 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. In a survey of 60 people, it was found that 25 play cricket, 26 play hockey, 26 play chess, 9 play both cricket and chess, 11 play both cricket and hockey, 8 play both hockey and chess, 3 play all three games. Find the number of people who play at least one of the three games.

2. Let X = {1, 2, 3, 4} and R is a relation on X defined as $x \mathrm{R} y \Leftrightarrow x$ divides y for all $x, y \in \mathrm{X}$. Find the elements of R. Check whether R is reflexive and symmetric ?

3. Define equivalence of propositions. Show that $\sim (\mathrm{P} \rightarrow \mathrm{Q}) \equiv \mathrm{P} \wedge \sim \mathrm{Q}$.

4. Write predicates for the following sentences :

   (a) All human beings are mortal

   (b) Some students are tall.

5. Describe Pigeonhole Principle. Find the minimum number of students in a class to be sure that three of them are born in the same month.

6. Define lattice and its properties.

7. Define regular and complete graphs with the help of suitable examples.

8. Describe graph traversal techniques.

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. Let X = { a, b, c }. The number of subsets of X are :

   (a) 3

   (b) 4

   (c) 7

   (d) 8

2. A = {1, 2, 3} and B = {2, 3, 4}, then A – B =

   (a) {1}

   (b) {2}

   (c) {1, 4}

   (d) {2, 3, 4}

3. Let $X = \{a, b, c\}$. Which of the following is a symmetric relation ?

   (a) $\{(a, c), (b, a), (a, a)\}$

   (b) $\{(b, c), (c, b), (c, a)\}$

   (c) $\{(a, b), (a, a), (b, a)\}$

   (d) $\{(a, a), (c, a), (c, c)\}$

4. Let $X = \{a, b, c\}$. Which of the following is a relation ?

   (a) $\{(a, c), (b, a), (b, b)\}$

   (b) $\{(b, c), (c, b), (c, a)\}$

   (c) $\{(a, a), (c, a), (b, b)\}$

   (d) $\{(a, a), (b, b), (c, c)\}$

5. Let $X = \{a, b, c\}$ and $Y = \{1, 2, 3\}$. Which of the following relations from X to Y is a function ?

   (a) $\{(a, 1), (b, 2), (c, 3)\}$

   (b) $\{(a, 1), (a, 2), (b, 1), (c, 3)\}$

   (c) $\{(a, 2), (a, 3), (b, 1)\}$

   (d) $\{(a, 1), (b, 2)\}$

6. The proposition $\sim P \rightarrow \sim Q$ is equivalent to :

   (a) $P \lor \sim Q$

   (b) $\sim P \lor Q$

   (c) $\sim P \land Q$

   (d) $P \land \sim Q$

7. Which of the following is a tautology ?

    (a) $\sim P \vee Q \vee R$

    (b) $P \vee \sim Q \vee R$

    (c) $\sim P \wedge \sim Q \wedge P$

    (d) $P \vee Q \vee \sim P$

8. The number of different three digit numbers that can be formed using the digits of the set {1, 2, 3}, if repetition is allowed is :

    (a)   27

    (b)   18

    (c)   12

    (d)   6

9. The value of $^{n}P_{n}$ is :

    (a) $n!$

    (b)   1

    (c)   0

    (d)   None of these

10. Which of the following statement is false about tree ?

    (a)   A tree is a connected graph.

    (b)   A tree has no cycle.

    (c)   A tree with n vertices has $n - 1$ edges.

    (d)   In a tree, there exists two different paths between a pair of vertices.

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