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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-2019

Time :* 3 *Hours ***[Maximum Marks : 80***

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

Section–A

Long Answer Types Questions

Note : Section 'A' contains Five (05) long-answer-type questions of Fifteen (15) marks each. Learners are required to answer any three (03) questions only. **(3×15=45)**

1. (a) Define an equivalence relation. Let R be a relation on the set of integers Z defined

as :

$R = \{(x, y) : x \in Z, y \in Z \text{ and } x \mid y\}$, where $x|y$ represents x divides y. Check whether R is an equivalence relation. (8 marks)

(b) Show that the mapping $f : R \to R$ defined as $f(x) = 2x + 3$ is invertible. Find its inverse. (7 marks)

2. (a) Write propositions for the following sentences : (8 marks)

(i) If I go to market and I buy a pen, then I sing a song.

(ii) If I watch a movie, then either I play football or I study.

(b) Prove that the following argument is a valid argument. (7 marks)

"If I play chess, then I study. I play chess. Therefore, I study."

3. (a) How many different numbers lying between 100 and 1000 can be formed with the digits 1, 2, 3, 4, 5 if (i) repitition of digits is not allowed (ii) repetition of digits is allowed. (8 marks)

(b) A committee of 3 persons is to be formed from a group of 5 men and 2 women. In how many ways can this be done so as to include at least one woman in the committee. (7 marks)

4. (a) Show that the set G = {0, 1, 2, ... , $m - 1$} of the first m non-negative integers is an obilion group if the composition is addition modulo m. (8 marks)

(b) Define a lattice. If (L, $\leq$) be a lattice then for all $a, b \in$ L, prove that $a \vee b = b$ if and only if $a \leq b$. (7 marks)

5. (a) Define the following matrces in the graph : (8 marks)

(i) Incidence matrix

(ii) Adjacency matrix

(b) Explain graph traversal techniques. (7 marks)

Section–B

Short Answer Types Questions

Note : Section 'B' contains Eight (08) short-answer-type questions of Seven (07) marks each. Learners are required to answer any Five (05) questions only. **(5×7=35)**

1. Let A, B and C are three sets. Prove that A–(B∩C) = (A – B) ∪ (A – C).

2. Let f : R → R and g : R → R be two functions defined as $f(x) = \frac{x+1}{2}$ and $g(x) = x^2$. Find fog (x) and go $f(x)$. Also find fog (2) and go $f(2)$.

3. Define tantology and contradiction with the help of suitable examples.

4. Write predicates for the following sentences :

(i) All tigers are brown.

(ii) Some politians are not corrept.

5. Define group homomorphism. If f : G→G^1 is a homomorphism, then show that $f(e) = e^1$, where e is the identity of G and e^1 is the identity of G^1.

6. Define a partial order relation. Let x = {1, 2, 3, 4, 6, 12, 18, 24} and '1' represents the relation 'divides'. Draw the Hasse diagram of (x, 1).

7. Define spanning tree and minimal spanning tree. Discuss any one algorithm of finding minimal spanning tree.

8. Define binary tree and height of a binary tree. Find the maximum height of a full binary tree with n vertices.