MCA-09

December - Examination 2016

MCA IInd Year Examination

Discrete Mathematics

Paper - MCA-09

Time : 3 Hours]   **[Max. Marks :- 80**

Note: The question paper is divided into three sections A, B and C. Use of non-programmable scientific calculator is allowed in this paper.

Section - A $8 \times 2 = 16$

Note: Section 'A' contain 08 Very Short Answer Type Questions. Examinees have to attempt all questions. Each question is of 02 marks and maximum word limit may be thirty words.

1) (i) Write the set of even natural numbers less than 9.

   (ii) Define an injective function.

   (iii) Define negation of a statement.

   (iv) Explain logical equivalence.

   (v) Write associative law for Boolean algebra.

   (vi) State principle of inclusion-exclusion.

   (vii) Define cyclc group.

   (viii) Define complete graph.

Section - B $4 \times 8 = 32$

Note: Section 'B' contain 08 Short Answer Type Questions. Examinees will have to answer any four (04) questions. Each question is of 08 marks. Examinees have to delimit each answer in maximum 200 words.

2) Prove that for set A, B and C

(i) $A - (B \cap C) = (A - B) \cap (A - C)$

(ii) $A - B = B' - A'$

3) Prove that relation R defined on set of integers by

$R = \{ (x, y) \mid x, y \in z \text{ and } x + y \text{ is even} \}$ is an equivalence relation.

4) Explain conditional and bi-conditional statements by using truth table.

5) If a is any element in a Boolean algebra B then prove that:

$a + x = 1$ and $ax = 0 \Rightarrow x = a'$

6) A person throw a dice and tosses a coin. The combined out comes of the dice and the coin are recorded. How many possible outcomes are there? Write all such possible outcomes.

7) Prove that any two right cosets of a subgroup are either disjoint or identical.

8) Prove that every field is an integral domain but converse is not true.

9) Draw the following graph:

(i) 3-regular but not complete

(ii) A complete bipartite graph having 2 vertices in one partite set and 4 vertices in other partite set.

Section - C   **2 × 16 = 32**

Note: Section 'C' contain 04 Long Answer Type Questions. Examinees will have to answer any two (02) questions. Each question is of 16 marks. Examinees have to delimit each answer in maximum 500 words.

10) (i) Find the adjacency matrix and incidence matrix of the multi graph shown in figure.
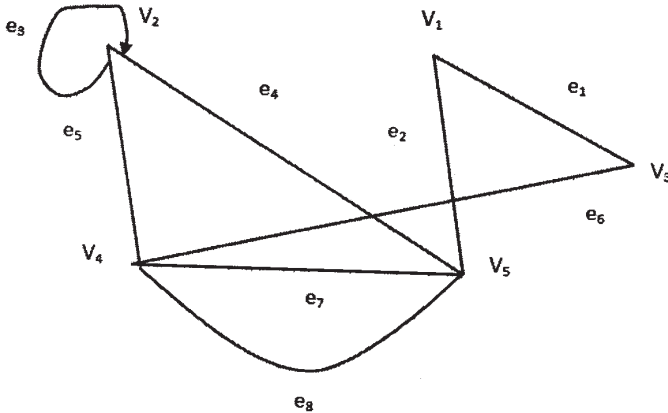
    (ii) Prove that every tree has either one or two centres.

11) (i) Prove that a group of order ≤ 5 is abelian

    (ii) A polygon has 44 diagonals, find the number of sides.

12) (i) If $f : NXN \rightarrow NXN$ defined by $f(a, b) = 3^a \times 4^b$, $(a, b) \in NXN$ then examine f for bijection.

    (ii) Using Pigeon-hole principle prove that among any group of 367 people, there must be at least two with same birth day.

13) Verify the validity of the following argument.

Every living thing is a planet or animal. John's gold fish is alive and it is not a planet. All animals have hearts. Therefore John's gold fish has a heart.

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