

MCA-09
June - 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 × 2 = 16

(Very Short Answer Questions)

Note: Section 'A' contain (08) Very Short Answer Type questions each question is of 02 marks. Examinees will have to answer **all** questions.

- 1) (i) Express the set $A = \{x : x \text{ is letter in word CAT}\}$ in Roster form.
- (ii) Define a function from set A to B.
- (iii) Define a statement.
- (iv) Define Tautology.

- (v) Prove that $(\forall x) (P(x)) \longrightarrow (\exists x) (P(x))$ is logically valid.
- (vi) Explain binary operation.
- (vii) State De-Morgen's law for Boolean algebra.
- (viii) How many numbers between 1 to 200 are divisible by 4.

Section - B

4 × 8 = 32

(Short Answer Questions)

Note: Section 'B' contain Short Answer Type Questions. Examinees have to answer **any four** (04) questions. Each question is of 08 marks.

- 2) Prove that:
 - (i) $B - \bar{A} = A \cap B$
 - (ii) $A \cup B = \phi \Rightarrow A = \phi$ and $B = \phi$
- 3) If X be the set of real number excluding 1. Show that the function $f : x \rightarrow x$, $f(x) = \frac{x+1}{x-1}$ is one-one and on to.
- 4) Explain the following logical connection
 - (i) Negation
 - (ii) Conjunction
 - (iii) Disjunction
 - (iv) Conditional
- 5) Using truth table prove that $(P \wedge Q) \wedge \sim (P \vee Q)$ is a contradiction.

- 6) If $D_8 = \{1, 2, 4, 8\}$ be the set of all divisors of 8 and let ‘ t ’ and ‘ \cdot ’ be two operations defined on D_8 as follows:

$$a + b = \text{LCM of } a \text{ and } b$$

$$a - b = \text{GCD of } a \text{ and } b$$

also for each $a \in D_8 \Rightarrow a^{-1} = \frac{8}{a}$ then prove that $(D_8, +, \cdot)$ is not a Boolean algebra.

- 7) How many 3 letters words can be formed?
 (i) With out repetition
 (ii) Repetition of letters is allowed
- 8) In how many ways can 5 gents and 4 ladies dine at a round table if no two ladies are to sit together.
- 9) Examine If the ring
 $R = \{a + bi ; a, b \text{ are integers, } i = \sqrt{-1}\}$ is a field also check for integral domain.

Section - C

$2 \times 16 = 32$

(Long Answer Questions)

Note: Section ‘C’ contain 04 Long Answer Type Questions. Examinees will have to answer **any two** (02) questions. Each question is of 16 marks.

- 10) (i) Prove that the number of vertices of odd degree in a graph is always even.

- (ii) Show that the simple graphs with following adjacency matrices are isomorphic.

$$\begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

- 11) (i) Prove that in any tree with two or more vertices there are at least two pendant vertices.
- (ii) Prove that every non-zero finite integral domain is a field.
- 12) (i) Prove that every finite group of order less than or equal to five is commutative group.
- (ii) Prove that every quotient group of a cyclic group is cyclic.
- 13) (i) Prove that any two left (right) cosets of a subgroup are either disjoint or identical.
- (ii) State pigeon hole principle. Use pigeon hole principle to find among 100 people. How many people born in same month.
