# BCA-02

## December - Examination 2016

## BCA Pt. I Examination

## Discrete Mathematics

## Paper - BCA-02

**Time : 3 Hours ]** **[ Max. Marks :- 100**

**Note:** The question paper is divided into three sections A, B and C.

**Section - A** **$10 \times 2 = 20$**

(Very Short Answer Questions)

**Note:** Section 'A' contain 10 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) Specify the set

$A = \{x/x$ is even positive number and $1 < x < 9\}$ in Roster form

(ii) Define a Tautology.

(iii) Define Domain and range of a relation.

(iv) Define maximal and minimal elements in a poset.

(v) Define a bijective function.

(vi) Define a Binary operation.

(vii) State Lagrange's theorem for groups.

(viii) Explain duality in Boolean algebra

(ix) Explain conjunctive normal form (CNF).

(x) Write names of universal gates.

**Section - B** **$4 \times 10 = 40$**

(Short Answer Questions)

**Note:** Section 'B' contain eight short answer type questions. Examinees will have to answer any four (04) questions. Each question is of 10 marks. Examinees have to delimit each answer in maximum 200 words.

2) Solve:

(i) $(C2BA)_{16} = (?)_{10}$

(ii) $(7437)_8 = (?)_{10}$

(iii) $(11000101)_2 = (?)_{10}$

(iv) $(100111.101)_2 = (?)_{10}$

3) Using laws of algebra of sets prove that -

(i) $A - B = A \cap B^1$

(ii) $A \cup B = (A - B) \cup B$

4) Verify whether $p \rightarrow \sim s$ is valid conclusion of the premises

$p \rightarrow q,\ s \rightarrow \sim q$

5) Prove that relation R defined on set of positive integers $Z^+$ such that $R = \{(a, b) / a + b \text{ is even}\}$ is an equivalence relation.

6) In a group G prove that

(i) $(a^{-1})^{-1} = a$ for all $a \in G$

(ii) $(ab)^{-1} = b^{-1}a^{-1}$ for all $a, b \in G$

7) If m is a fixed positive integer then prove that the set

$s = m\,z = \{m\,x \,/\, x \in z\}$ is a subring of ring $(z_1 + {}_1x)$

8) In a Boolean algebra B, show that $a = b$. If and only if $a^1b + ab^1 = 0$

9) Transform the following Boolean expression into disjunctive normal form $x_1 + x_1x_2 + x_1x_2x_3$

**Section - C** **2 × 20 = 40**

(Long Answer Questions)

**Note:** Section 'C' contain 4 Long Answer Type Questions. Examinees will have to answer any two (02) questions. Each question is of 20 marks. Examinees have to delimit each answer in maximum 500 words. Use of non-programmable scientific calculator is allowed in this paper.

10) Explain the following logic gates :-

(i) NOR GATE

(ii) NANO GATE

(iii) XOR GATE

(iv) XNOR GATE

11) Explain following computer codes :-

(i) UNI CODE

(ii) EBC DIC

(iii) BCD

(iv) ASCII

12) If a, b, c and d are arbitrary elements of a lattice $(A, \leq)$ then prove that

(i) $a \leq b$ and $c \leq d \Rightarrow a \wedge c \leq b \wedge d$

(ii) $a \wedge (a \vee b) = a$

(iii) $a \vee (b \vee c) = (a \vee b) vc$

(iv) $a \leq b \Longleftrightarrow a \vee b = b$

13) (i) Prove that a non-empty subset H of a group G is a sub group of G If and only If $ab^{-1}$ is in H whenever a and b are in H.

(ii) Show that elements in a group G which commute with every element of G forms a sub group of G.