Roll No. …………………..

BCA–05

Discrete Mathematics

Bachelor of Computer Application (BCA–11/16)

Second Semester, Examination, 2017

Time : 3 Hours **Max. Marks : 70**

Note : This paper is of **seventy (70)** 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 fifteen (15) marks each. Learners are required to answer *two* (02) questions only.

1. If A be a square matrix, show that with the help of an appropriate example :

   (a) $A A'$ is a symmetric matrix.

   (b) $A + A'$ is a symmetric and $A - A'$ is skew symmetric.

   (c) A is the sum of symmetric and skew symmetric matrix.

2. Prove that a ring R is commutative ring if and only if :

$$(a + b)^2 = a^2 + 2ab + b^2 \text{ for all } a, b \in R$$

3. (a) In a class of 120 students numbered 1 to 120, all even numbered students opt all Physics, whose numbers are divisible by 5 opt for chemistry and those whose numbers are divisible by 7 opt for Math. How many opt for none of the three subjects ?

(b) Show that $p \rightarrow \sim q$ is a valid conclusion from the given $p \rightarrow q$, $r \rightarrow \sim q$.

4. Solve by Cramer's rule :

$$x + y - 2z = 1$$

$$2x - 7z = 3$$

$$x + y - z = 5$$

Section–B

(Short Answer Type Questions)

Note : Section 'B' contains eight (08) short answer type questions of five (5) marks each. Learners are required to answer *six* (06) questions only.

1. Prove that :

$$A \cup A' = U \text{ and } A \cap A' = \phi$$

2. Define Nilpotent matrix, idempotent matrix, scalar matrix and unit matrix with suitable example.
3. Define tautology and contradiction with suitable example.
4. Define a ring with suitable example.
5. State and prove pigeonhole principle.
6. Prove that :

$$A \times (B \cup C) = (A \times B) \cup (A \times C)$$

7. If $f: A \rightarrow B$ and $g: B \rightarrow C$ be one onto function, then prove that (g o f) is also one to one onto.

8. Prove by induction that the sum of thee cubes of 3 consecutive integers is divisible by 9.

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. A .... is an ordered collection of objects.

   (a) Relation

   (b) Function

   (c) Set

   (d) Proposition

2. The set O of odd positive integers less than 10 can be expressed by ....

   (a) {1, 2, 3}

   (b) {1, 3, 5, 7, 9}

   (c) {1, 2, 5, 9}

   (d) {1, 5, 7, 9, 11}

3. Power set of empty set has exactly .... subset.

   (a) One

   (b) Two

   (c) Zero

   (d) Three

4. What is the Cartesian product of A ={1, 2} and B = {a, b} ?

   (a) {(1, a), (1, b), (2, a), (b, b)}

   (b) {(1, 1), (2, 2), (a, a), (b, b)}

   (c) {(1, a), (2, a), (1, b), (2, b)}

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

5. The Cartesian product of B × A is equal to the Cartesian product A × B. Is it true for false ?

   (a) True

   (b) False

6. Which is the cardinality of the set of odd positive integers less than 10 ?

   (a) 10

   (b) 5

   (c) 3

   (d) 20

7. Which of the following two sets are equal ?

   (a) A = {1, 2} and B = {1}

   (b) A = {1, 2} and B = {1, 2, 3}

   (c) A = {1, 2, 3} and B = {2, 1, 3}

   (d) A = {1, 2, 4} and B = {1, 2, 3}

8. The set of positive integers is ....

   (a) Infinite

   (b) Finite

   (c) Subset

   (d) Empty

9. What is the cardinality of the power set of the set {0, 1, 2} ?
   (a) 8
   (b) 6
   (c) 7
   (d) 9

10. A partial ordered relation is transitive, reflexive and ....
   (a) Antisymmetric
   (b) Bisymmetric
   (c) Antireflexive
   (d) Asymmetric