 Roll No. ……………………..

BCA–05

Discrete Mathematics

Bachelor of Computer Applications (BCA–11/16/17)

Second Semester Examination, 2017

Time : 3 Hours **Max. Marks : 80**

Note : This paper is of **eighty (80)** marks containing **three (03)** Sections A, B and C. Learners are required to 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 nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. (a) Define Cramer's rule.

   (b) Solve by Cramer's rule :

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

$$2x - 7z = 3$$

$$x + y - z = 5$$

2. (a) If a set A has *m* elements, how many relations are there from A to A ?

(b) How many 3-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed ?

3. (a) Explain the basic properties of ring.

(b) Prove that a ring R is commutative ring if and only if :

$$(a+b)^2 = a^2 + 2ab + b^2$$

for all $a, b \in$ R.

4. (a) What is the difference between integral domains and fields ?

(b) Let $f : \mathrm{R} \rightarrow \mathrm{R}$ be defined by the function $f(x) = 3x - 6$. Find the formula for the inverse function $f^{-1} : \mathrm{R} \rightarrow \mathrm{R}$.

Section–B

(Short Answer Type Questions)

Note : Section 'B' contains eight (08) short answer type questions of eight (08) marks each. Learners are required to answer *four* (04) questions only.

1. Use mathematical induction to show that 5 divides $n^5 - n$, whenever n is a non-negative number.
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. Explain Gaussian Elimination Scheme using a suitable example.

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. Define Groups. Explain the various properties of groups.

Section–C

(Objective Type Questions)

Note : Section 'C' contains ten (10) objective type questions of one (1) 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 of A × B. Is it true or 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