S-597 Roll No. ……………………..

BCA–05

Discrete Mathematics

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

Second Semester, Examination, 2018

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) Explain Cramer's Theorem. What are normal random variables ?

 (b) Solve by Cramer's rule :

$$x + y + z = 7$$

$$2x - 2y + 3z = 14$$

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

$$(x, y, z) = (2, 1, 4)$$

2. (a) Find the number of words, with or without meaning, that can be formed with the letters of the word ‘SWIMMING.

(b) If $f(x) = -15x + 12$ and $g(x) = 12x^2 + 12x + 15$, find $f(3) - g(3)$.

(c) Let $f(x) = \sqrt{x} - 3$ and $g(x) = \frac{3}{x}$. Find *f* o *g*, *g* o *f*, *f* o *f* and *g* o *g*.

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

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

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

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

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

Section–B

(Short Answer Type Questions)

Note : Section ‘B’ contains eight (08) short answer type questions of eight (8) marks each. Learners are required to answer *four* (04) questions only.

1. Prove that if a relation R on a set S is transitive and irreflexive, then it is asymmetric.

2. Use mathematical induction to show that 5 divides n^5-n, whenever n is a non-negative number.

3. Define Groups. Explain the various properties of groups.
4. What is a ring ? Explain with suitable example.
5. Prove that :
   (a) $A \cap B = B \cap A$
   (b) $A \cup A = A$
6. Explain Gaussian Elimination Scheme using a suitable examples.
7. Show that a function $f : R \rightarrow R$ defined as $f(x) = 2x + 3$ for all $x \in R$ is both injective and surjective function.
8. Define tautology and contradiction with suitable example.

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 colllection 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