## 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 ( $\mathbf{8 0}$ ) 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 :

$$
\begin{gathered}
x+y-2 z=1 \\
2 x-7 z=3 \\
x+y-z=5
\end{gathered}
$$

2. (a) If a set A has $m$ elements, how many relations are there from A to A ?
P. T. O.
(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 :

$$
(a+b)^{2}=a^{2}+2 a b+b^{2}
$$

for all $a, b \in \mathrm{R}$.
4. (a) What is the difference between integral domains and fields?
(b) Let $f: \mathrm{R} \rightarrow \mathrm{R}$ be defined by the function $f(x)=3 x-6$. 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.

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6. Explain Gaussian Elimination Scheme using a suitable example.
7. If $f: \mathrm{A} \rightarrow \mathrm{B}$ and $g: \mathrm{B} \rightarrow \mathrm{C}$ be one onto function, then prove that $(g \circ f)$ 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 $\qquad$ 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 $\qquad$ subset.
(a) One
(b) Two
(c) Zero
(d) Three
4. What is the Cartesian product of $\mathrm{A}=\{1,2\}$ and $\mathrm{B}=\{a, b\}$ ?
(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 $\mathrm{B} \times \mathrm{A}$ is equal to the Cartesian product of $\mathrm{A} \times \mathrm{B}$. 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) $\mathrm{A}=\{1,2\}$ and $\mathrm{B}=\{1\}$
(b) $\mathrm{A}=\{1,2\}$ and $\mathrm{B}=\{1,2,3$,
(c) $\mathrm{A}=\{1,2,3\}$ and $\mathrm{B}=\{2,1,3\}$
(d) $\mathrm{A}=\{1,2,4\}$ and $\mathrm{B}=\{1,2,3\}$
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

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