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BCA-05

Discrete Mathematics

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

Second Semester

Examination-2019

Time : **3** *Hours* *[Maximum Marks : 80*

Note : This paper is of Eighty (80) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

Section–A

Long Answer Types Questions

Note : Section 'A' contains Five (05) long-answer-type questions of Fifteen (15) marks each. Learners are required to answer any three (03) questions only. **(3×15=45)**

1. Define the following relations with the help of suitable examples :

   (i) Equivalence relation

   (ii) Partial order relation

2. (a) Define invertible function. Find the inverse of $f(x) = 2x - 3$. (8)

   (b) Construct the truth table of

   $(P \wedge (P \rightarrow Q)) \rightarrow Q$ (7)

3. (a) Define Pigeonhole principle. Find the minimum number of students in a class to be sure that three of them are born in the same month. (8)

   (b) Define a group. (7)

4. Define Ring, Integral domain and field. Give suitable examples.

5. (a) Find the inverse of the matrix : (7)

$$A = \begin{bmatrix} 1 & -2 & 2 \\ 2 & -3 & 6 \\ 1 & 1 & 7 \end{bmatrix}$$

   (b) Solve the linear system of equations.(8)

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

$$2x + 5y - z = -4$$

$$3x - 2y - z = 5$$

Section–B

Short Answer Types Questions

Note : Section 'B' contains Eight (08) short-answer-type questions of Seven (07) marks each.

Learners are required to answer any Five (05) questions only. **(5×7=35)**

1. Define the following sets :

   (a) Power set

   (b) Complement of a out

2. Define tautology and contradiction with the help of suitable examples.

3. Define logical equivalence. Show that :

   $\sim (P \vee \theta) \vee (\sim P \wedge \theta) \equiv \sim P$

4. Find the number of ways to arrange 10 students (5 boys and 5 girls) in a row if :

   (a) no restriction is given.

   (b) extreme positions must be occupied by two particular boys.

   (c) extreme positions must be occupied by boys only.

5. Prove that the set of integers is a group under addition.

6. Prove that in a ring R, $\forall a_1 b \in R$:

   (i) $a.0 = 0 = 0.a$

   (ii) $a(-b) = (-a)b = -ab$

7. Find AB where :

$$A = \begin{bmatrix} 1 & 0 & 4 \\ 2 & 3 & 2 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & -2 \\ 3 & 1 \\ 2 & 4 \end{bmatrix}$$

8. Find the rank of the matrix :

$$\begin{bmatrix} 2 & 1 & 3 \\ 4 & 6 & -1 \\ 5 & 1 & 0 \end{bmatrix}$$