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BCA-05

Discrete Mathematics

Bachelor of Computer Application

(BCA)

2nd Semester Examination June 2022

Time: 2 Hours Max. 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 – type questions)

Note: Section 'A' contains Five (05) long-answer-type questions of Twenty (20) marks each. Learners are required to answer any two (02) questions only.

[2 x 20 = 40]

Q.1.(A)Let R be a relation on the set of integers Z defined as

xRy $\Leftrightarrow$ x – y is divisible by 2

x, y ϵ z.

Show that R is an equivalence relation.

P.T.O.

(B) Let f: $R \to R$ is defined as

$f(x) = 2x + 5$

show that f is one-one onto.

Q.2.(A) Write the following sentences in symbolic form.

(i) If I play, then I sing a song.

(ii) If I go to school and I attend classes, then I get 'A' grade.

(B) Show that $\sim (p \wedge q) \equiv \sim p \vee \sim q$.

Q.3.(A) Define permutation and combination with the help of suitable examples.

(B) Show that the set of non zero rational numbers forms a group under multiplication.

Q.4. Define the following matrix:

(i) Row matrix

(ii) Scalar matrix

(iii) Upper triangular matrix

(iv) Symmetric matrix

(v) Antisymmetric matrix

P.T.O.

Q.5.(A)Find the rank of the matrix A, where

$$A = \begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 4 & 6 & 2 \\ 1 & 2 & 3 & 2 \\ 3 & 6 & 9 & 3 \end{bmatrix}$$

(B) Solve the following system of linear equations using Cramer's rule

$x + y + z = 3, x + 2y + 3z = 6, 3x – y + 2z = 4$

Section – B
(Short-answer-type questions)

Note: Section 'B' contains Eight (08) short-answer-type questions of Ten (10) marks each. Learners are required to answer any Four (04) questions only.

[4 x 10 = 40]

Q.1. Let A = {1, 2, 3, 4} and B = {3, 4, 5, 6}

Find (i) $(A \cup B) – (A \cap B)$

(ii) $(A – B) \cup (B – A)$

Q.2. Let f: R → R and g: R → R be two function defined as $f(x) = x^2$ and $g(x) = 2x + 1$

Find (i) gof(x) and hence gof(2)

(ii) fog(x) and hence fog(2)

P.T.O.

Q.3. Define tautology and contradiction with the help of suitable example.

Q.4. How many different three digit numbers can be formed using the digits of the set {1, 2, 3, 4, 5} if
(i) repetition if not allowed.
(ii) repetition is allowed.

Q.5. Let (G, *) be a group, then show that
$(a * b)^{-1} = b^{-1} * a^{-1}$ for all a, b ∈ G.

Q.6. Define Ring with the help of a suitable example.

Q.7. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 1 & 2 \end{bmatrix}$ *and* $B = \begin{bmatrix} 2 & 3 \\ 1 & 4 \\ 0 & 1 \end{bmatrix}$

Find A^1 B^1

Q.8. Find the inverse of the matrix.

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$$
