**A–1262**

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# BCA-05

## Bachelor of Computer Application (BCA)

## Discrete Mathematics

Examination February, 2026

Time : 2:00 Hrs. Max. Marks : 70

***Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.***

### Section–A

**(Long Answer Type Questions)** (2×19=38)

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. (a) Let set :

$A = \{2, 3, 4\}$, $B = \{4, 5, 6\}$, $C = \{2, 3, 7, 8\}$

Find :

(i) $(A \cup B) \cap C$

(ii) $(A \cup B) - C$

(iii) $(A/B) \cup (B/A)$

(iv) $B^C$

(v) $(A \cap B \cap C)$ (10)

(b) Define an equivalence relation with the help of suitable example. (9)

2. (a) Let :

P : He is rich

Q : He is happy

Write the following statements into symbolic logic forms using appropriate logical connectives.

(i) If he is rich, then he is unhappy.

(ii) He is neither rich nor happy.

(iii) He is not happy or he is not rich.

(iv) If he is not happy then he is rich.

(v) He is poor and he is unhappy. (10)

(b) Show that :

$$(P \vee Q) \wedge (\sim P \wedge \sim Q)$$

is a contradiction. (9)

3. (a) Define a function with an example. If $f(x) = x + 2$ and $g(x) = 2x$, find $(fog)(x)$. (10)

(b) State the Pigeonhole Principle. Give a real-life example of the Pigeonhole Principle. If 8 balls are placed into 5 boxes, show that at least 2 balls are in one box. (9)

4. (a) Define permutation. Derive the formula for nPr. Find the number of ways 4 books can be arranged on a shelf from a total of 6 books. (10)

(b) Define a semigroup. Explain its basic properties with suitable examples. (9)

5. (a) Define rank of a matrix. Find the rank of the matrix : (10)

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

(b) What is Gaussian Elimination ? Briefly describe its basic steps. (9)

## Section–B

**(Short Answer Type Questions)** (4×8=32)

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Show that the Cartesian product is not commutative ? It is commutative only for equality of sets ?

2. Define a relation on a set. Discuss the different types of relations-reflexive, symmetric, transitive, and antisymmetric-with suitable examples for each.

3. $((A \rightarrow B) \leftrightarrow \sim A)$ Convert the statement into basic connectors.

4. Let $f : R \rightarrow R$ be a function defined as $f = 4x - 6$. Show that $f$ is one-one onto function.

5. Write the truth table of the following propositions :

   (i) $(P \vee Q) \sim R$

   (ii) $P \leftrightarrow (Q \vee R)$

6. Solve the following linear system of equations using Cramer's rule :

$$x + y + z = 9$$

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

$$2x - y + z = 6$$

7. Define a ring with the help of suitable examples.

8. Let :

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

Find :

(i) A.B

(ii) B.A

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