

# S-733

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## BCA-05

**Discrete Mathematics**

**Bachelor of Computer Application (BCA)**

2<sup>nd</sup> Semester, Examination 2022(Dec.)

Time: 2 Hours

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.

### Section – A

(Long Answer – type questions)

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.

[2 x 19 = 38]

P.T.O.

Q.1. (a) Define the following terms with suitable examples: (10)

(i) Union of two sets

(ii) Intersection of two sets

(b) Solve the following linear system of equation using Cramer's rule. (9)

$$x + y + z = 6$$

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

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

Q.2. (a) Let  $X = \{1, 2, 3, 4\}$  and  $R = \{(x, y) : x \leq y, \forall x, y \in X\}$  be relation on  $X$ . Find the elements of  $R$  and check whether it is reflexive, symmetric and Transitive? (10)

(b) Define the following matrices with suitable examples: (9)

(i) Symmetric matrix

(ii) Involutory matrix

Q.3. (a) Define one-one and onto functions. Prove that the function  $f: R \rightarrow R$  defined as  $f = 2x + 1$  is one-one and onto function. Also find the inverse of  $f$ . (10)

- (b) Prove that the set  $X = \{0, 1, 2, \dots, m-1\}$  is a group under the composition addition modulo  $m$ . (9)

Q.4. (a) Write the truth table of the following propositions: (10)

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

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

- (b) Define an Integral domain with suitable example. (9)

Q.5. (a) Define permutation and combination with the help of suitable examples. (10)

- (b) Find the inverse of the following matrix. (9)

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

P.T.O.

## 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 any Four (04) questions only.

[4 x 8 = 32]

Q.1. Let  $X = \{1,2,3,4\}$ ,  $Y = \{3,4,5,6\}$  and  $Z = \{1,2,5,6\}$  the find the following :

- (i)  $X \cup Y \cup Z$ ,
- (ii)  $X \cap Y \cap Z$
- (iii)  $(X-Y) \cup Z$
- (iv)  $(X \cup Y) - Z$

Q.2. Define a partial order relation. Let  $X = \{1,2,3,4\}$  and  $R = \{(x, y) : x \geq y, \forall x, y \in X\}$ . Check whether R is a partial order relation?

Q.3. Let  $X = \{1,2,3,4\}$  and  $f: X \rightarrow X$  and  $g: X \rightarrow X$  defined as  $f = \{(1,3), (2,1), (3,4), (4,3)\}$  and  $g = \{(1,2), (2,3), (3,1), (4,1)\}$ . Find

- (a)  $f \circ g$
- (b)  $g \circ f$
- (c)  $f \circ f$
- (d)  $g \circ g$

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

(i)  $A.B$

(ii)  $B.A$

Q.5. Define rank of a matrix. Find the rank of the matrix

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

Q.6. Define Tautology and Contradiction with the help of suitable examples.

Q.7. Find the number of seven-letter words that can be formed using the letters of the word "BENZENE" if

(i) there is no restriction

(ii) all the words start with "B" only.

Q.8. Prove that the set  $\{1, -1, i, -i\}$  is a group with respect to multiplication.

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