A–801

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BCA-05

Bachelor of Computer Application (BCA)

(Discrete Mathematics)

2nd Semester Examination, 2024 (June)

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) Solve the following linear system of equations using Gauss elimination method : 10

$$x + y + z = 6$$

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

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

(b) Find the inverse of the following matrix : 9

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

2. (a) Define a partial order relation. Let X = {1, 2, 3, 6, 12, 18} and R = {(x, y) : x/y, $\forall\ x, y \in X$} be a relation on X. Draw the Hasse diagram of the relation R. 10

(b) Define the following : 9

(i) Contradiction

(ii) Proposition

(iii) Logical connectors

3. (a) Define inverse function. Check whether the function $f : R \rightarrow R$ defined as $f = 3x - 5$ is an inverse function ? 10

(b) Prove that the set $X = \{0, 1, 2, 3, 4\}$ is a group under the composition addition mudulo 5. 9

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

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

(ii) $P \rightarrow (Q \wedge \sim R)$

(b) Prove that $P \rightarrow Q$ is logically equivalent to $\sim Q \rightarrow \sim P$. 9

5. (a) (i) In how many ways 4 students can sit in a row ?

(ii) In how many ways 4 students can sit in a row if one particular student always occupy corner position.

(iii) Find the number of permutations of 2 elements from a set of 5 elements.

(iv) Find the number of combinations of 3 elements from a set of 5 elements.

(v) In how many ways a committee of 2 boys and 1 girl can be formed from a group of 3 boys and 2 girls. 10

(b) Define a field with a suitable example. 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. Draw the Venn diagram of the following sets :

   (i) $X \cup Y \cup Z$

   (ii) $X \cap Y \cap Z$

   (iii) $(X - Y) \cup Z$

   (iv) $(X \cup Y) - Z$

2. Let P : I play football and Q : I go to market. Write the propositions for the following sentences :

   (i) I go to market but I do not play football.

   (ii) I do not go to market and I do not play football.

   (iii) If I play football, then I go to market.

   (iv) If I do not go to market then I play football.

3. Define Pigeonhole principle for counting. Find the minimum number of students so that at least 3 students have same month of birth.

4. Let $A = \begin{bmatrix} 2 & 0 & 2 \\ 4 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 0 & 2 \\ 3 & 2 & 1 \end{bmatrix}$. Find (i) $A' + B'$ (ii) $A'.B'$.

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

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

6. Define Tautology. Check whether the proposition $(\sim P \wedge (P \vee Q) \rightarrow Q$ is a tautology ?

7. Define an equivalence relation with the help of suitable example.

8. Prove that the set of integers forms a ring with respect to usual addition and multiplication.

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