



End Term (Odd) Semester Examination December 2024

Roll no... 2492525

Name of the Course and semester: BCA AI & DS / BCA , 1st Semester

Name of the Paper: Mathematical Foundation of Computer Sciences

Paper Code: TBD 103/ TBC 103

Time: 3 hour

Maximum Marks: 100

Note:

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

Q1.

(2X10=20 Marks)

a. Prove that (i) $A - (B \cap C) = (A - B) \cup (A - C)$

(CO 1)

(ii) $(A - B) - C = (A - C) - (B - C)$

b. Out of 80 students in a class, 60 play football, 53 play hockey, and 35 both the games. How many students:

- (i) do not play these games,
- (ii) play only hockey but not football.

(CO 1)

c. Proof the both distributive laws of algebra on the basis of set theory.

(CO 1)

Q2.

(2X10=20 Marks)

a. Let $R = \{(2, 4), (2, 5), (1, 5)\}$ and $A = \{1, 2, 3\}$, find the reflexive, symmetric and transitive closure of R, using

- (i) Composition of relation R
- (ii) Graphical representation of R.

(CO 2)

b. What is the difference between Asymmetric relation, Antisymmetric relation and Transitive relation, explain with suitable examples.

(CO 2)

c. (i) Consider the following relation on $\{1, 2, 3, 4, 5, 6\}$

$$R = \{(i, j) : |i - j| = 2\}$$

Is R transitive? Is R reflexive? Is R symmetric?

(ii) If R be a relation in the set of integers \mathbb{Z} defined by

$$R = \{(x, y) : x \in \mathbb{Z}, y \in \mathbb{Z}, (x - y) \text{ is multiple of } 3\}$$

Show that it is an equivalence relation.

(CO 2)

Q3.

(2X10=20 Marks)

a. Determine gcd (a, b). Find s and t such that $\text{gcd}(a, b) = s.a + t.b$

(i) $a = 1819, b = 3587$

(ii) $a = 414, b = 662$

(CO 3)

b. Find the gcd of 595 and 252 and express it in terms in the form of $252m + 595n$.

(CO 3)



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- c. (i) Use prime factorization to find least common multiple of 119 and 272. (CO 3)
(ii) If $\gcd(a, b) = d$, then $\gcd(a/d, b/d) = 1$

(2X10=20 Marks)

Q4.

- a. Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer. (CO 4)

- b. Solve $a_{n+2} - 4a_{n+1} + 4a_n = 2^n$ (CO 4)

- c. In a simultaneous throw of a pair of dice, find the probability of getting a total more than 7. (CO 4)

(2X10=20 Marks)

Q5.

- a. Find the value of the determinant

$$\begin{vmatrix} -2 & 1 & 6 \\ 3 & 4 & 1 \\ -4 & 2 & 12 \end{vmatrix}$$

(CO 5)

- b. If $A = \begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$, then find $A^3 - 5A - 17I$.

(CO 5)

- c. Find the matrix x from; $5x - 2 \begin{bmatrix} 1 & -2 \\ 1 & 0 \end{bmatrix} = 5 \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix} - 2x$

(CO 5)