

MAY-25-0778
CSPC-411 (Discrete Mathematics (AI&ML, CSE,AI&DS))

B.Tech.-4th NEP

Time : 3 Hours**Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all, select one question each from section A, B, C, D. Section E (Question-9) is compulsory.

Section-A

1. (A) A detective has interviewed four witness to a crime. From the stories of witnesses the detective has concluded that if the butler is telling the truth then so is the cook, the cook and the gardener cannot both be telling the truth, the gardener and the handyman are not both lying, and if handyman is telling truth then cook is lying. For each of four witnesses, can the detective determine whether the person is telling the truth or lying? (6)
- (B) Let $A = \{-2, -1, 0, 1, 2\}$, $B = \{0, 1, 4\}$, and $f: A \rightarrow B$ is defined as $f(x) = x^2$ is a function. Find whether it is one-to-one or as bijection? (6)
2. (A) Let $A = \{i, j, k\}$ and $B = \{a, e, i, o, u\}$. Let $R = \{(i, e), (i, u), (j, a), (j, e), (j, o), (k, i)\}$ and $S = \{(i, e), (i, i), (i, u), (j, a), (j, u), (k, e), (k, i)\}$. Find $R \cup S$, $R \cap S$, $S - R$, and $R \oplus S$. (6)
- (B) Let $U = \{1, 2, 3, 4, 5, 6\}$. Let the fuzzy sets $A = \{0.3|1, 0.4|2, 0.1|5\}$ and $B = \{0.25|1, 0.34|4, 0.78|5, 0.51|6\}$. Find. (6)

a) $A \cup B$

b) $A \cap B$

c) $A \oplus B$

SECTION-B

3. (A) If $R = \{(a, b)/a, b \text{ are positive integers such that } a - b \text{ is an odd positive integers}\}$, then whether the relation R is reflexive/symmetric/transitive/equivalence? (6)
- (B) The function $f: R \rightarrow R$ is a function defined by $f(x) = 10x - 7$. If $g = f^{-1}$ then find the value of $g(x)$. (6)
4. (A) Construct the truth table to determine whether each of the following is a tautology, a contingency or an absurdity? (6)
- (B) Verify that $(p \cap q \cap \neg p)$ is a contradiction and $(p \rightarrow q) \cap (p \cap q)$ is a contingency. (6)

SECTION-C

5. (A) How many edges does a graph have if it has vertices of degree 4, 3, 3, 2, and 2? Draw such a graph along with the complete justification and explanation. (6)
- (B) Describe composition of functions. (6)
6. Explain Ford-Fulkerson algorithm with example. (12)

SECTION-D

7. (A) A connected planar graph has 19 edges dividing the plane into 9 regions. Find the number of vertices in the graph? (6)
- (B) How many groups can be formed from a group of 9 marbles if each group must contain at least 3 marbles? (6)
8. What do you mean by Spanning tree? Describe in detail Kruskal's algorithm to find minimum spanning tree. (12)

SECTION-E

9. (A) Differentiate between Inclusive-OR and Exclusive-OR operation. (2)
- (B) If $A = \{6, 2, 3\}$, find power set of A? (2)
- (C) Differentiate between floor and ceiling functions. (2)
- (D) What do you mean by planar graphs? (2)
- (E) Explain the inference rule Modus Tollens with an example. (2)
- (F) Explain Bipartite graphs with an example. (2)