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Paper Code : PCC- CS401/PCC-CS401/PCCCS 401/PCCCS401 Discrete Mathematics

UPID : 004407

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) What is a cycle in a graph?

(II) Which law of inference states that "if A implies B, and B implies C, then A implies C"?

(III) What do you mean by the symmetric difference of set A and B?

(IV) How many reflexive relations are possible on a set with n elements?

(V) What do you mean by a 'relation'?

(VI) What is a spanning tree in a graph?

(VII) Write the Absorption laws in respect of SET Theory ?

(VIII) Write the contrapositive of ~p -> ~q.

(IX) What is the inverse of p -> ~q ?

(X) "K6 is a planar graph." - State TRUE or FALSE

(XI) What is Cantor's diagonal argument?

(XII) Write the De Morgan's laws of SET operations.

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. What is an inverse function? How do you obtain inverse of a function? Explain with example. [5]
3. Five speakers A, B, C, D and E speak in a meeting one after the other. Find the probability that A speaks before B. [5]
4. Prove by induction: $n^2 + n$ is even where n is a positive integer. [5]
5. There are 5 white balls, 4 red balls, and 3 blue balls in a box. If you draw 2 balls at random from the box, what is the probability that both balls are either white or red? [5]
6. In how many ways can you invite one or more of your five friends to your birthday party? [5]

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Define a SET with proper examples according to the classical set theory. What are the different set operations usually performed - explain with examples. [7]

   (b) What do you mean by finite and infinite sets ? Also, explain the concepts of finite countable sets, infinite countable sets and infinite uncountable sets with proper examples. [2+6]

8. (a) How many non-negative integral solutions are there of the equation x1 + x2 + x3 + x4 = 20? [7]

   (b) Show that number of prime numbers is infinite. [8]

9. (a) Show that universal quantifier distributes over conjunction and existential quantifier distributes over disjunction. [8]

   (b) Brown, Jones and Smith are suspected of income tax evasion. They testify under oath as follows: [7]
   Brown: Jones is guilty and Smith is innocent
   Jones: If Brown is guilty, then so is smith.
   Smith: I am innocent, but at least one of the others is guilty.
   Assuming everyone told the truth. Who is/are guilty/innocent ?

10. (a) What do you mean by Eulerian and Hamiltonian walks? [5]

    (b) What is Vertex Colouring and Colouring of Edges in graph theory ? [5]

    (c) Define Minimal Spanning tree (MST) with an example. [5]

11. (a) What is a bipartite graph? How do you determine if a graph is bipartite or not? [5]

(b) Show that trees are bipartite graphs. [5]

(c) Determine the chromatic polynomial of *Kn* [5]

*** END OF PAPER ***