



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

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  $\sim p \rightarrow \sim q$ .
- (IX) What is the inverse of  $p \rightarrow \sim q$  ?
- (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  $x_1 + x_2 + x_3 + x_4 = 20$ ? [ 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  $K_n$

[ 5 ]

\*\*\* END OF PAPER \*\*\*