

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**

Paper Code : BDS501 Discrete Mathematics

UPID : 5000013



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) Write the Boolean expression for an AND gate with inputs A and B.
- (ii) What is the probability of the sure event according to probability axioms?
- (iii) What is the cardinality of the set  $A = \{2, 4, 6, 8\}$ ?
- (iv) If  $A = \{1,2\}$ ,  $B = \{2,3\}$ , find  $A \cap B$ .
- (v) In mathematical induction, what is the step called where we verify the statement for the first natural number (usually  $n=1$ )?
- (vi) What is the multiplication rule in counting state?
- (vii) What are the three properties of a partial order relation?
- (viii) A relation R on set  $A = \{1,2\}$  defined as  $R = \{(1,1), (2,2)\}$  is \_\_\_\_\_.
- (ix) Give one application of trees in computer science.
- (x) What is a bridge in a graph?
- (xi) What is the expected value of a geometric distribution with success probability p?
- (xii) If 13 people are in a room, prove two share a birth month.

**Group-B (Short Answer Type Question)**Answer *any three* of the following :

[ 5 x 3 = 15 ]

2. Define relation. Give an example and explain its domain, co-domain, and range. [5]
3. Explain the difference between implication ( $\rightarrow$ ) and biconditional ( $\leftrightarrow$ ). [5]
4. Prove that in any set of 11 integers, there exist two whose difference is divisible by 10. [5]
5. State the pigeonhole principle with an example. [5]
6. Show that  $f(x) = 3x + 5$  is a bijection from  $\mathbb{Z} \rightarrow \mathbb{Z}$ . [5]

**Group-C (Long Answer Type Question)**Answer *any three* of the following :

[ 15 x 3 = 45 ]

7. (a) Define Eulerian path with an example. [5]  
(b) Define Eulerian cycle with an example. [5]  
(c) State Euler's theorem for Eulerian paths and cycles. [5]
8. (a) Use the inclusion-exclusion principle to find how many numbers from 1 to 50 are divisible by 2 or 3. [7]  
(b) Find the number of ways to arrange the letters of the word **COMPUTER**. [8]  
How many 3-digit numbers can be formed using digits  $\{1, 2, 3, 4, 5\}$  without repetition?
9. (a) Define surjective function with example. [5]  
(b) Check whether composite of two surjective functions is surjective or not. [5]  
(c) Explain with example: why a constant function is not injective? [5]
10. (a) Construct the truth table for the logical expression:  $(P \wedge Q) \rightarrow P$ . [7]  
(b) Explain the logical connective 'exclusive OR' (XOR) with a truth table. [8]
11. (a) Expand  $(x + y)^5$  using binomial theorem. [8]  
(b) Write the first 6 rows of Pascal's triangle. [7]

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