

The LNM Institute of Information Technology**Department: CSE****DMS (CSE119)****Exam Type: Mid Term****Time: 90 minutes****Date: 04/03/2019****Max. Marks: 30**

Instruction: 1. All the questions are compulsory.
2. No query will be handled during exam.
3. Write relevant assumptions with justification if required.

Q.1 Using generalized inclusion- exclusion principle, deduce the number of surjections from a domain containing m elements to a codomain consisting of n elements. [Note: Don't write the direct expression, you will have to find out the complete expression] [Marks 4]

Q. 2 Using generating function, solve the following recursive relation [3 Marks]

$$a_n = a_{n-1} + 2, a_1 = 1$$

Q.3 Write a recursive algorithm to compute the n^{th} Fibonacci number F_n and establish its correctness.[Marks 2+3=5]

Q.4 Prove that the predicate associated with the following algorithm follows the property of loop invariant. This algorithm sorts n elements $X=\{x_1, x_2, \dots, x_n\}$ using bubble sort. [Marks 3]

Algorithm Bubble Sort (X, n)

1. Start algorithm
2. For $i=1$ to $n-1$ do
3. For $j=1$ to $n-i$ do
4. If $x_j > x_{j+1}$ then
5. Swap x_j and x_{j+1}
6. End algorithm

Q.5 How many reflexive relations and symmetric relations are there on a set with ' n ' elements? Explain. [Marks 5]

Q.6 Prove that 'The composition of any function with the identity function is the function itself. [Marks 4]

Q.7 Find the minimum number of students in a class to be sure that four out of them are born in the same month. [Marks 4]

Q.8 Consider the below diagrams for different fuzzy sets A, B and compute [Marks 1+1]

