Roll No. .....

97667

B.C.A. 2nd Semester

Examination–May, 2017

Mathematical Foundation of Computer Science

Paper-BCA-108

Time : 3 hours ***Max. Marks : 80***

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt **five** questions in all. Question No. 1 is **compulsory** and attempt **four** more questions by selecting **one** question from each unit. All questions carry equal marks.

1. Compulsory question

(a) What do you mean by Correlation ? List various types of correlation.

(b) Find the median for the series: 10, 12, 8, 9, 70, 60, 40, 80.

(c) What is a Graph ? Explain with the help of an example.

(d) What is Weighted Graph ?

(e) What is a Tree ? What are its properties ?

(f) What is Merge Sort ?

(g) What is LHRRWCC ?

(h) Find the first four terms of a sequence from the Recursive Formula:

$a_n = 5a_{n-1}, \quad n \geq 1$ with the initial condition $a_0 = 8$

UNIT-I

2. (a) In a study on patients, the following data were obtained. Calculate the arithmetic mean.

Age in Years	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No. of Cases	1	0	1	10	17	38	9	3

(b) Find the median of the following frequency distribution.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	15	17	19	27	21	15

3. (a) The Mean and Variance of 7 observations are 8 and 16 respectively. If five of the observations are 2, 4, 10, 12, 14, find the remaining two observations.

(b) Calculate Karl Pearson's coefficient of correlation for the following data:

x:	5	10	15	20	22	25	30
y:	10	12	8	7	6	5	3

UNIT-II

4. (a) Describe the method for analyzing an algorithm. What do you mean by best case and worst case time complexity of an algorithm ?

(b) Define linear search algorithm. Find the number of comparisons required to search 9 in the sequence 1, 3, 4, 5, 6, 8, 9, 11 using linear search.

5. (a) Prove that the degree of any vertex in a simple graph of 'n' vertices cannot exceed n–1.

(b) Define Isomorphic and Homeomorphic graph with the help of a example.

UNIT-III

6. (a) What is Spanning Tree? Explain the various methods for constructing spanning tree for a connected simple graph.

(b) Draw a binary tree for the following Preorder and Inorder traversals:
Preorder: D E B F C A
Inorder: D B E A F C.

7. (a) (i) Convert the decimal number $(76.25)_{10}$ into binary number.

(1.10101)$_2$ into decimal number.

(b) Explain the algorithm for bubble sort and use bubble sort to put the elements of the list 7, 8, 4, 6, 1, 0, 9 in increasing order.

UNIT-IV

8. (a) Solve the recurrence relation: $a_n + 2a_{n-1} + a_{n-2} = 0$, for $n \geq 2$.

(b) Using Principle of Mathematical Induction, prove that:

$$1.2.3 + 2.3.4 + 3.4.5 + \ldots\ldots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}, \text{ for all } n \in N.$$

as a linear combination of

numbers.

(b) Solve the congruences: $13x = 10 \pmod{28}$