Roll No. .....

97667

B.C.A. 2nd Semester

Examination–May, 2015

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. Answer the following questions:

(a) Define measure of dispersion. List the method of measure of dispersion.

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

(c) Discuss the properties of algorithm.

(d) Define degree of a vertex with example.

(e) Define Hamiltonian path.

(f) What is complete binary tree? Explain with example.

(g) Find the first five terms of the sequence $a_n = 3a_{n-1} + 4a_{n-2}$, $n \geq 3$, $a_1 = 0$, $a_2 = 5$

(h) Define LHRR. What are its advantages?

Unit-I

2. (a) The following table shows the marks secured by 100 students in an examination.

Marks	0-10	10-20	20-30	30-40	40-50
Number of students	15	20	35	20	10

Find the mean marks obtained by the students.

(b) Calculate the standard deviation of the following distribution.

Age (in years)	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Members	3	61	132	153	140	51	2

3. (a) Calculate the coefficient of correlation for the following ages of husband and wife.

Age of Husband	23	27	28	28	29	30	31	33	35	36
Age of wife	18	20	22	27	21	29	27	29	28	29

(b) $4x - 2y = 3$ and $2x - 3y = 5$ are two lines of regression. Find

(i) Regression coefficients b_{xy} and b_{yx}

(ii) Correlation coefficient between x and y

(iii) Estimate y, when $x = 3$

Unit-II

4. (a) Define linear search algorithm. Also find the number of comparison required to search 28 in the sequence 1, 3, 4, 5, 6, 7, 10, 12, 18, 20, 28, 33, 35, 47 using linear search algorithm.

(b) Find the least integer n such that $f(x) = 2x^3 + x^2 \log x$ is $O(x^n)$.

5. (a) What do you mean by regular graph? Find k, if a k-regular graph with 7 vertices has 14 edges. Also draw the k-regular graph.

(b) Explain adjacency and incidence matrix representation with the help of example.

Unit-III

6. (a) Prove that a connected graph with n vertices and n - 1 edges is a tree.

(b) What do you mean by traversal algorithm? Explain with example preorder and postorder traversal.

7. (a) (i) Convert the decimal number 231.231 into their binary equivalent.

(ii) Convert the binary number 1101.1101 into their decimal equivalent.

(b) Define insertion sort and use it to put elements of the list 7, 3, 4, 8, 1 in increasing order.

Unit-IV

8. (a) Using principle of mathematical induction, prove that

$1.2 + 2.3 + 3.4 + \ldots\ldots n(n+1) = n(n+1)(n+2)/3$, for all $n \in N$

(b) Solve the recurrence relation subject to given initial conditions

$b_n - 4b_{n-1} + 4b_{n-2} = 0$ for $n \geq 2$, $b_0 = 1$, $b_1 = 6$

9. (a) Find the l.c.m. and g.c.d of 119,272

(b) Show that: $2.7^n + 3.5^n - 5 \equiv 0 \pmod{24}$