Roll No. .....

97667

BCA 2nd Semester (Full & Re-Appear) Examination – May, 2024

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper : BCA-108

Time : Three Hours] *[Maximum 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 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. (a) If the mean of 17, 9, 11, x and 15 is 12, find the value of x.

(b) What do you mean by regression ?

(c) What is directed graph ?

(d) What is regular graph ?

(e) Convert the decimal number 27 into binary number.

(f) Find the g.c.d. of 858 and 325.

(g) Define congruence with the help of example.

(h) What is Fibonacci sequence ?

UNIT – I

2. (a) Find the average marks of students from the following data :

Marks (more than)	0	10	20	30	40	50	60	70 up to 80
No. of Students	100	97	87	73	50	25	6	2

(b) Calculate the standard deviation of the following frequency distribution :

Class Interval :	0-4	4-8	8-12	12-16
No. of Students	4	8	2	1

3. (a) Calculate the 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

(b) Find the equation of regression lines for the data given below

x	6	2	10	4	8
y	9	11	5	8	7

UNIT – II

4. (a) Write linear search algorithm and analyze its complexity.

   (b) Describe the characteristics of algorithm and explain its time complexity and worst case complexity.

5. (a) Find a graph whose adjacency matrix is :

$$A = \begin{bmatrix} 0 & 1 & 1 & 2 \\ 1 & 0 & 2 & 1 \\ 1 & 2 & 1 & 0 \\ 2 & 1 & 0 & 0 \end{bmatrix}$$

   (b) Define the degree of a vertex and prove that the number of vertices of odd degree is always even.

UNIT – III

6. (a) What is minimum spanning tree ? Explain with example the Kruskal's algorithm for constructing the minimum spanning tree.

   (b) What do you mean by tree traversal ? Explain preorder traversal with the help of example

7. (a) (i) Convert decimal number $(123.123)_{10}$ to binary number.

   (ii) Convert the binary number $(110011.011)_2$ to decimal number.

   (b) 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 relations : $a_n + 2a_{n-1} + a_{n-2} = 0$, for $n \geq 2$.

   (b) Using Principle of Mathematical Induction show that $10^{2n-1} + 1$ is divisible by 11 for all positive integers n.

9. (a) Multiply 1011 by 0110 by divide-and – conquer integer multiplication method.

   (b) Encrypt the message "HARD WORK" by using encryption function $f(p) = (3p + 7) \bmod 26$.