

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.

- (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 ?

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- (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**

- (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

- (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

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- (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  $n \geq 2$ . <https://www.mdustudy.com>  
 (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  $f(p) = (3p + 7) \bmod 26$ .