

Unit-IV

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

$$1 + 4 + 7 + \dots + (3n - 2) = \frac{n(3n - 1)}{2}$$

- (b) Solve the recurrence relation $a_n = 10a_{n-1} - 25a_{n-2}$
for $n \geq 2$ with $a_0 = 1, a_1 = 3$ 8

9. (a) Find the g.c.d. of 190 and 34. Also express the g.c.d.
as a linear combination of the given numbers. 8

- (b) Solve the congruence $222x \equiv 12 \pmod{18}$ 8

BCA- 2nd Semester (Full & Re-appear)

Examination, May-2023

MATHEMATICAL FOUNDATION OF
COMPUTER SCIENCE

Paper -BCA-108

Time allowed : 3 hours] [Maximum marks : 80

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

1. (a) Give two demerits of median.
(b) What do you mean by correlation? List various types of correlation.
(c) Determine whether $f(x) = x^2 + 5x + 1$ is $O(x^2)$.
(d) Find n , if a complete graph having n vertices has 15 edges.
(e) Define complete binary tree with an example.
(f) What is merge sort?
(g) Find the first five terms of the sequence given by recursive formula
$$c_n = c_{n-1} + c_{n-3}, n \geq 4, c_1 = 1, c_2 = 2, c_3 = 0$$

(h) Give the statement of Division algorithm. 16

Unit-I

2. (a) Calculate the mean from the following data: 8

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	15	20	35	20	10

- (b) Calculate the Standard Deviation for the following frequency distribution: 8

Class Interval	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

3. (a) Calculate Karl Pearson's coefficient of correlation from the following data: 8

Husband's Age	20	21	22	23	24	25	26
Wife's Age	17	18	19	20	21	22	23

- (b) The equations of two lines of regression are

$$4x + 3y + 7 = 0 \text{ and } 3x + 4y + 8 = 0.$$

Find: 8

- (i) Mean of x and y
 (ii) Regression coefficients
 (iii) Correlation coefficient between x and y

Unit-II

4. (a) Write an algorithm to find the roots of a quadratic equation. 8
 (b) Write a short note on time complexity of Binary Search Algorithm. 8
5. (a) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. 8
 (b) Differentiate between Euler graph and Hamiltonian graph with the help of examples. 8

Unit-III

6. (a) Define spanning tree. Explain the methods for constructing a spanning tree in a simple connected graph. 8
 (b) Prove that the number of edges is one less than the number of vertices in a tree. 8
7. (a) Convert the binary number $(101.1101)_2$ to decimal number. 8
 (b) Explain insertion sort technique. Use the insertion sort to sort the following list:
 7, 8, 4, 6, 1, 0, 9 8