

9. (a) Find the least positive incongruent solution of $7x \equiv 5 \pmod{256}$.
- (b) Solve the recurrence relation $a_n = 2a_{n-1} + 8a_{n-2}$ for $n \geq 2$ with $a_0 = 4$ and $a_1 = 10$.

Roll No.

97667

BCA 2nd Semester (Full and Re-Appear)

Examination – October, 2020

**MATHEMATICAL FOUNDATION OF COMPUTER
SCIENCE**

Paper : BCA-108

Time : 1.45 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 any *three* questions. All questions carry equal marks.

1. (a) Find the arithmetic mean of the marks obtained by 8 students of a class given as :
24, 67, 55, 78, 15, 89, 90, 45
- (b) Find the range of the following series :
15, 10, 11, 9, 13, 17, 20
- (c) Write four merits of an algorithm.
- (d) Write an algorithm to find greatest among three numbers.
- (e) What is merge sort ?

- (f) Define spanning tree with example.
- (g) Find a such that $a \equiv 7 \pmod{5}$.
- (h) Find the first four terms of a sequence from the formula $a_n = 3a_{n-1} + 4a_{n-2}$ where $n \geq 3$ with initial conditions $a_1 = 1, a_2 = 5$.

2. (a) Calculate the mean of the following distribution :

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	12	18	27	20	17	6

(b) Find the median of the following data :

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	15	17	19	27	19	12

3. (a) The mean and variance of 7 observations are 8 and 16. If five of the observations are 2, 4, 10, 12, 14, find the remaining two observations.
- (b) Find the covariance between x and y for the following distribution :

x	1	2	3	4	5
y	2	4	6	8	10

4. (a) What is Big-O notation ? What are its advantages ? Determine whether x^3 is $O(x^2)$.

- (b) What do you mean by binary search algorithm ? Write the algorithm for binary search.

5. (a) Define degree of a vertex and incoming degree of a vertex with the help of example.
- (b) Draw a complete graph K_5 , with vertices A, B, C, D, E .
- (c) Draw the diagram of the graph $G(V, E)$, where $V = \{a, b, c, d, e\}$ and $E = \{(a, c), (a, e), (d, e), (b, d), (d, d), (b, b), (c, a)\}$.
- (d) Prove that degree of any vertex in a simple graph of n vertices cannot exceed $n - 1$.

6. (a) Prove that a connected graph with n vertices and $n - 1$ edges is a tree.
- (b) Explain binary tree and pre order traversal algorithm with the help of examples.

7. (a) (i) Convert the decimal number 59.36 into its binary equivalent.
- (ii) Convert the binary number 11101101 into its decimal equivalent.
- (b) Sort the following list : 7, 8, 4, 6, 1, 0, 9 using bubble sort.

8. (a) Using principle of mathematical induction prove that $7^n - 3^n$ is divisible by 4, for all $n \in N$.
- (b) Find g.c.d. and l.c.m. of 227, 148.