Roll No.: ....

MID SEMESTER EXAMINATION APRIL 2023

Name of the Program: **B.Tech (CSE)**   Semester: 4th

Name of the Course: Design and analysis of Algorithm   Course Code: TCS 409

Time: 90 Minutes   **Maximum Marks: 50**

Note:

   i.   Answer all the questions by choosing any one of the subs questions.
   ii. Each questions carries 10 marks

Q1		(10 Marks)	CO1
(a)	Solve the following recurrence relation: - $T(n) = T(\sqrt{n}) + \log(n)$ $T(1) = 1$		
	OR		
(b)	Write the pseudo-code to find a^n, i.e., a raise to the power n in $\log(n)$ time complexity.		
Q2		(10 Marks)	CO2
(a)	Prove mathematically after writing the pseudo-code that complexity of Quick sort is $O(n*\log(n))$ in average case.		
	OR		
(b)	Draw and show how Quick sort will work on the following array of numbers if we take last element as pivot. Show only iteration after partition method (No need to show each step of partition). 36, 2, 9, 20, 17, 15, 30, 29, 1.		
Q3		(10 Marks)	
(a)	Write build-heap pseudo code. Show how build-heap takes $O(n)$ time. Build-heap uses to convert any given array to heap (min/max)		CO2
	OR		
(b)	Given a heap in form of array, write pseudo code to sort the array using heap sort.		
Q4		(10 Marks)	CO1
(a)	Compare bubble, insertion, and selection sort on the basis of number of swaps and time and space complexity.		
	OR		
(b)	Write the recursive code for finding n^{th} Fibonacci and find the time and space complexity of the algorithm.		
Q5		(10 Marks)	CO1
(a)	Write pseudo code for binary search. What are the strength and limitations of binary search?		
	OR		
(b)	Given 5 integers say **A, B, C, D, and E** which represents the cubic equation $Ax^3 + Bx^2 + Cx + D = E$, the task is to find the integral solution for this equation. How will you find the value of x. **(Only explanation, no code is required)**		CO2