H Roll No. 2294038

TCS–409

B. TECH. (CSE)

(FOURTH SEMESTER)

MID SEMESTER

EXAMINATION, March, 2024

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 1½ Hours

Maximum Marks : 50

Note : (i) Answer all the questions by choosing any *one* of the sub-questions.

(ii) Each sub-question carries 10 marks.

1. (a) Write the pseudo code for quick sort. Draw and show how quick sort will sort the following numbers : (CO1)

2, 6, 1, 0, 7, 9, 4

OR

(b) Analyze the following place of code and find the space and time complexity. (CO1)

```
sum = 0;
for(int i=1; i<=n; i++){
for(int j=1); j<=n; j=j+i){
sum++;
  }
}
```

2. (a) Write the pseudo code for bucket sort. In what all cases it is better than counting sort ? (CO2)

OR

(b) Write pseudo code for selection sort. Compare between insertion and selection sort on basis of time complexity, number of comparison and number of swaps. (CO1)

3. (a) Write iterative code to find the nth Fibonacci. Find the time and space complexity of the code. (CO2)

OR

(b) Write the pseudo code of bubble sort. What will be the output after 5 iterations of selection sort on the following numbers ? (CO2)

5, 7, 1, 2, 3, 9, 0, 4, 6

4. (a) Compare between different sorting algorithm on basis of in place, stable, online, external sort. Is merge sort stable or can we make it stable ? If yes write the code for stable merge sort. (CO1)

OR

(b) Write the recursive code for linear search. Using recurrence relation find the time complexity of the code. (CO1)

5. (a) Solve the following recurrence relations using backward substitution. Base case for all is T(1) = 1. (CO2)

(i) $T(n) = 2T(n/2) + n$

(ii) $T(n) = T(\sqrt{n}) + 1$

(iii) $T(n) = 4T(n/2) + n^3$

OR

(b) Write a function to build heap from an array. Prove that the time complexity of building a heap from an array is $O(n)$.

(CO2)