

Nirma University

Institute of Technology

Semester End Examination, December-2020

B.Tech. in Computer Science and Engineering, Semester -V

2CS503 – Design and Analysis of Algorithms

Roll /
Exam No.

Supervisor's Initial
with Date

Time: 1.5 Hours

Max Marks: 40

- Instructions:
1. Attempt all the questions.
 2. Figures to right indicate full marks.
 3. Draw neat sketches wherever necessary.

Q-1 Do as directed **[10]**

a) Solve the following recurrence relation :- [5]

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

b) Consider an array $A[1...n]$ (where, 1 is the initial index and n is the last index) containing n elements. Write the modified Insertion sort algorithm, which starts scanning the elements from index n , $n-1, \dots$, to index 1, to sort the elements in ascending order. Write the time complexities of the algorithm in various scenarios. [5]

Q-2 An array contains n distinct elements. Design an algorithm for finding the median of the array, by forming groups of seven elements. Derive the expression of running time of the algorithm. Also derive the expression of running time, if groups of three elements are formed. **[10]**

Q-3 Given a set S of n activities with start time, S_i , and finish time, F_i , of an i^{th} activity. Design a greedy algorithm which computes the maximum size of mutually compatible activities. Take a suitable example, show the working of your algorithm and thereby analyze its time complexity. **[10]**

Q-4 A trader uses the following currencies for trading: U.S. Dollar (US\$), Singapore Dollar (SG\$), Euro, Yen and Lira. The exchange rates are given in the table below. A trader can do exactly one exchange daily. If the exchange is not performed, multiplication factor given in the corresponding principal diagonal would be applied. The trader starts with U.S. Dollar \$1, and has to maximize the profit within four days. Use dynamic programming and find the best exchange sequence. The last exchange must be to U.S. Dollar. Trader can use any currency for exchange, any number of times. **[10]**

	US\$	SG\$	Euro	Yen	Lira
US\$	0.9	2	3	6	5
SG\$	0.6	0.95	1.1	0.5	0.4
Euro	0.3	1	0.8	1	8
Yen	0.2	3	1	0.85	0.1
Lira	0.15	2.1	0.2	9	0.75

OR

- Q-4** Compare and contrast: Branch-and-Bound approach and Backtracking approach. A directed weighted graph of four cities is given below. Let city A be the source and the destination city. Apply Branch-and-Bound approach, such that all cities are visited exactly once, and the total cost is minimum. [10]

