



B.Tech V Semester Supplementary Examinations, July 2022

DESIGN AND ANALYSIS OF ALGORITHMS

(CSE)

Maximum Marks: 70

Date:06.07.2022 Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define the time and Space complexity with an example.
- 2 Find worst -case, best- case, average- case time complexity of the binary search.
- 3 Explain the properties of strongly connected components.
- 4 List the applications of backtracking.
- 5 Write control abstraction of the Greedy method.
- 6 Define Job sequencing with deadlines with an example.
- 7 State the principle of optimality with an example.
- 8 Explain travelling sales person problem.
- 9 Distinguish between deterministic and non deterministic algorithm.
- 10 Write the control abstraction algorithm for LC search.

Part-B

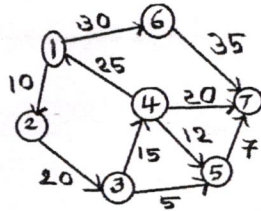
Answer All the following questions.

(10M X 5=50Marks)

- 11 a) Solve the following recurrence:
 $T(n) = 4T(n/2) + n$, Where $n \geq 1$ and is a power of 2. [5]
b) Sort the records with the following index values in the ascending order using quick sort algorithm.
2, 3, 8, 5, 4, 7, 6, 9, 1 [5]
- OR
- 12 a) Explain Stassen's Matrix Multiplication with an example. [5]
b) Write algorithm of Merge sort. [5]
- 13 a) What is weighting rule for Union (i,j)? How it improves the performance of union operation? [5]
b) Explain AND/OR graphs with an example. [5]
- OR
- 14 a) What is sum-of-subsets problem? Write a recursive backtracking algorithm for sum of subsets problem. [5]
b) Explain Hamiltonian cycle with an example? [5]

- 15 a) Consider the Knapsack instance with $n=3, m=20$
 $(P_1, P_2, P_3) = (25, 24, 15), (W_1, W_2, W_3) = (18, 15, 10)$. find the optimal solution using greedy method? [5]
 b) Explain Prim's algorithm in detail. [5] OR

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- a) Solve single source shortest path problem with given graph? [5]
 b) Explain Kruskal's algorithm with an example. [5]
- 17 a) Consider the Knapsack instance $n=3, (w_1, w_2, w_3) = (2, 3, 4), (p_1, p_2, p_3) = (1, 2, 5), m=6$ find the optimal solution using Dynamic programming? [5]
 b) Show Reliability Design with an Example. [5] OR
- 18 Design an OBST for $c(i,j) \ 0 \leq i \leq j \leq 4$ the identifier set $(a_1, a_2, a_3, a_4) = (\text{do}, \text{if}, \text{int}, \text{while})$ with $(p_1, p_2, p_3, p_4) = (3, 3, 1, 1)$ and $q(0:4) = (2, 3, 1, 1, 1)$ [10] OR
- 19 a) Draw the portion of the state space tree generated by LCBB for the knapsack instances: $n=5, (P_1, P_2, \dots, P_5) = (12, 10, 5, 9, 3), (w_1, w_2, \dots, w_5) = (3, 5, 2, 5, 3)$ and $M=12$. [5]
 b) Explain the classes of NP-hard and NP-complete. [5] OR
- 20 Consider the following TSP cost matrix; draw the state space tree by using LCBB. [10]

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

(a) Cost matrix