Code No: 135AF **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January/February - 2023
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE, IT)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define Big 'Oh' notation.	[2]
b)	Compare Quick Sort and Merge Sort.	[3]
c)	What is an articulation point in a graph? Give an example.	[2]
d)	Construct the state space tree for 4-Queens problem with bounding function.	[3]
e)	Write an algorithm for simple Union operation.	[2]
f)	What is Minimum Spanning Tree? Give an example.	[3]
g)	Write the difference between the Dynamic programming and the Greedy method.	[2]
h)	What is mean by state space tree? Give an example.	[3]
i)	Define cook's theorem.	[2]
j)	Draw the relation of P, NP, NP-Hard and NP-Complete.	[3]

PART – B

(50 Marks)

2.a) Sort the following data using Quick Sort and illustrate each step with appropriate figure for each iteration. [20, 12, 35, 15, 11, 19, 35]
b) Write the Recurrence relation and derive the best case complexity for the Quick Sort. [5+5]

OR

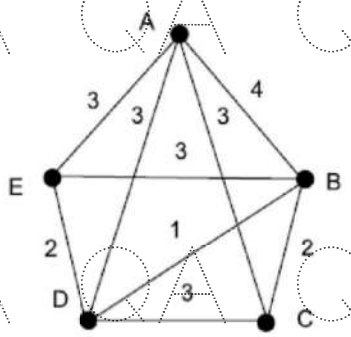
3.a) Describe asymptotic notations Big Oh (O), Omega (Ω) and Theta (Θ) notations and show their behavior using graphical representation.
b) Give the asymptotic bounds for the equation $f(n)=2n^3-6n+30$ and represent in terms of Θ notation. [5+5]

4. Generate the state space tree and find the solutions for the subset sum for N=7, m=35, w={5,7,10,12,15,18,20} using back tracking approach. [10]

OR

5. Write an algorithm for Graph Coloring problem and explain with an example. [10]

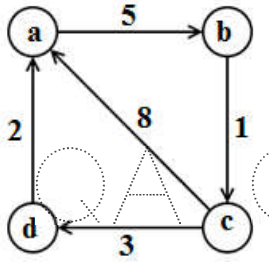
6. Explain the concept of minimum cost spanning tree? What are the different algorithms exist for obtaining minimum cost spanning tree. Compute the minimum cost spanning tree using Prim's algorithm for the given graph. Draw the spanning tree generated at each step. [10]



OR

7. Write greedy algorithm for knapsack problem. Find the solution for the following Knapsack problem using greedy method.
(p1,p2,p3,p4)=(2,5,8,1), (w1,w2,w3,w4)=(10,15,6,9) and m=30. [10]

8.a) Write an algorithm for all pairs shortest path. Define its complexity.
b) Compute the shortest distance between each pair of nodes for the following graph using all pair shortest path algorithm. [5+5]



OR

9. Use the function OBST to compute w(i, j), r(i, j) and c(i, j), $0 \le i \le j \le 4$ for the identifier set (a1,a2,a3,a4)=(do, if, int, while) with p(1:4)=(3,3,1,1) and q(0:4)=(2,3,1,1,1) using r(i,j)'s construct optimal binary search tree. [10]

10. Generate the state space tree using FIFO Branch and Bound and find the shortest path followed by the travelling salesperson instance defined by the cost matrix given below. [10]

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 6 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

OR

11. Explain circuit satisfiability problem with a circuit diagram. Show that circuit satisfiability problem is NP- hard. [10]

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