Code No: 155EV **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January/February - 2023
DESIGN AND ANALYSIS OF ALGORITHMS
(Computer Science and Information Technology)

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 omega notation.	[2]
b)	Write an algorithm of binary search.	[3]
c)	What is 4-color problem?	[2]
d)	Explain about connected components with examples.	[3]
e)	What is the important feature of dynamic programming?	[2]
f)	Discuss about the reliability design problem.	[3]
g)	Give an example of spanning tree.	[2]
h)	Briefly explain applications of Greedy method.	[3]
i)	Define state space tree.	[2]
j)	Explain about Least Cost(LC) Search.	[3]

PART – B

(50 Marks)

2.a) Write an algorithm of quick sort.
b) Explain about big-oh and theta notations. [5+5]

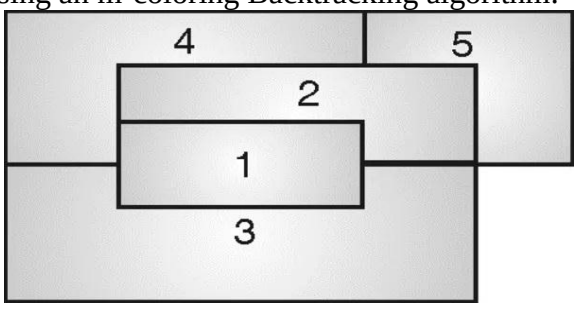
OR

3.a) Derive the time complexity of Merge sort.
b) Distinguish between time complexity and space complexity. [5+5]

4. Consider the sum-of-subset problem, n = 4, Sum = 13, and w1 = 3, w2 = 4, w3 = 5 and w4 = 6. Find a solution to the problem using backtracking. Show the state-space tree leading to the solution. Also, number the nodes in the tree in the order of recursion calls. [10]

OR

5. Construct a planar graph for the following map. Explain how to find m-coloring of this planar graph by using an m-coloring Backtracking algorithm. [10]



6. Use the function OBST to compute w(i,j), r(i,j), and c(i,j), $0 \leq i < j \leq 4$, for the identifier set (a1,a2,a3,a4) = (cout, float, if,while) with p(1) = 1/20, p(2) = 1/5, p(3) = 1/10, p(4) = 1/20, q(0) = 1/5, q(1) = 1/10, q(2) = 1/5, q(3) = 1/20, and q(4) = 1/20. Using the r(i,j)'s construct the optimal binary search tree. [10]

OR

7. Define Dynamic programming. Solve the following 0/1 Knapsack Problem using dynamic programming n=4, m=30, (w1,w2,w3,w4) = (10,15,6,9) and (p1, p2, p3, p4) = (2,5,8,1). [10]

8. Show how Prim's algorithm can be implemented using heap. What would be the time complexity of the algorithm? [10]

OR

9. Let G(V,E) be any weighted connected graph.
a) If C is any cycle of G, then show that the heaviest edge of C cannot belong to a minimum-cost spanning tree of G.
b) Assume that F is a forest that is a subgraph of G. Show that any F-heavy edge of G cannot belong to a minimum-cost spanning tree of G. [10]

10.a) Describe the classes NP-hard and NP-complete in detail.
b) Write a non-deterministic algorithm of sorting an elements in an array. [5+5]

OR

11.a) Briefly explain applications of branch and bound technique.
b) Write an algorithm LC Branch and Bound. [5+5]

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