Registration No :

Total Number of Pages : 02

B.Tech
RCS4C002/RIT4C002

4th Semester Regular/Back Examination: 2021-22
Design and Analysis of Algorithms
BRANCH(S): CSE, CSEAIME, CST, ELECTRICAL & C.E, IT

Time : 3 Hour
Max Marks : 100
Q.Code : J775

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions :** (2 x 10)

a) Is greedy algorithm suitable to find the optimal solution?
b) Write the advantages and disadvantages of Breadth First Search over Depth First Search.
c) What is the physical significance of asymptotic notations?
d) Explain the strategy of dynamic programming.
e) Write the recursion of merge sort and solve it by Master's method.
f) Given three matrices A(10x50), B(50x100) and C(100x5). What is the minimum number of scalar multiplications required to multiply these three matrices.
g) What is the difference between LIFOBB and LCBB?
h) Differentiate between decision problem and optimization problem
i) Differentiate between deterministic and non deterministic algorithm.
j) What is heuristics? How it solves the problem?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 × 8)

a) What do you mean by time complexity of an algorithm? Explain the best, worst and average case time complexity.
b) Solve the following recurrence using Iteration method.
$$T(n) = 1 \text{ for } n=1$$
$$= 5T(n/2) + cn^2 \text{ for other values of } n$$
c) Sort the following array of elements using randomized quick sort
12, 67, 34, 78, 23, 45, 69, 17, 28, 10, 27, 59
d) Write the Kruskal's algorithm to construct the minimum spanning tree and find the time complexity.
e) Explain the strategy of greedy technique to find the optimal solution of fractional knapsack problem?
f) Construct the state space tree for solving 4-queen problem and explain how backtracking can be used to solve the problem with reduced time complexity.
g) Can we say greedy algorithm as an approximation algorithm? Justify your answer.
h) Define matrix chain multiplication problem. Explain how dynamic programming

technique finds the optimal solution of it.

i) Explain topological sorting with a suitable example.

j) What is reducibility? Explain with example.

k) Is Dijkstra's algorithm suitable for graphs with negative weight edges? Justify your answer.

l) Explain the following problems.
Vertex cover decision problem and Vertex cover optimization problem,
Clique Decision problem and Max Clique problem,
Chromatic number Decision problem and Chromatic number optimization problem

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) What is recursion? Explain the recursion tree method to solve the recursion. **(8)**

b) Explain how greedy algorithm works to find the optimal solution of activity selection problem. **(8)**

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Q4 a) Construct the decode tree for the given letters and their frequencies of occurrence in the message. **(8)**
(a, b, c, d, e, f, g) = (1, 1, 2, 3, 5, 8, 13)

b) Find the longest common subsequence in the following given two sequences **(8)**
X="ROADS" Y="CROSS"

Q5 a) Explain how the LIFO Branch and Bound technique works to solve the 8-puzzle problem. Explain by constructing the state space tree. **(8)**

b) Assuming 3-SAT problem as an NP-complete problem, reduce Node cover decision problem to 3-SAT problem **(8)**

Q6 a) What is approximation algorithm? Explain a 2-approximation algorithm to solve Travelling Salesman Problem. **(8)**

b) Explain P, NP, NP-hard and NP-complete class of problems. **(8)**