C4-R4: ADVANCED ALGORITHMS

NOTE:

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours   **Total Marks: 100**

1.

a) Define an algorithm. List various criteria used for analyzing an algorithm

b) Use a recursion tree to give an asymptotically tight solution to the recurrence $T(n) = T(\alpha n) + T((1 - \alpha)n) + cn$, where α is a constant in the range $0 < \alpha < 1$ and $c > 0$ is also a constant.

c) Solve following recurrence using master method $T(n) = 9T(n/3) + n$

d) Show how quick sort can be made to run in $O(n \lg n)$ time in the worst case.

e) Explain in brief characteristics of greedy algorithms. Compare Greedy Method with Dynamic Programming Method.

f) Define time complexity and space complexity of an algorithm.

g) Differentiate Backtracking and Branch and bound.

                                                                               (7x4)

2.

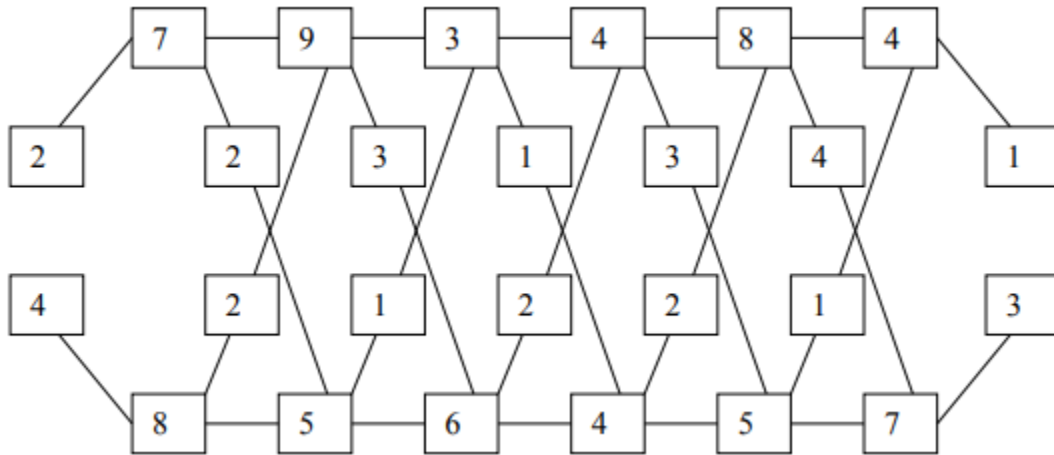a) Execute the Dijkstra's algorithm on the following graph, with single-source B.
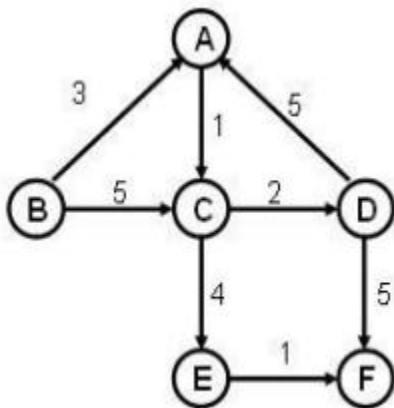
b) Find Upper bound of following recurrence equation using Recurrence Tree Method.

$T(n) = 2T(n/2) + c n2$

                                                                               (9+9)

3.

a) A car assembly plant having two assembly lines with six stations on each the time required by each station is given below in figure:


If entry & exit time for line 1 is 2, 1 and for line 2 is 4, 3 then find optimal path & time by which car can be moved within assembly plant.

b) Explain how to find Longest Common Subsequence of two strings using Dynamic Programming Method.

(9+9)

4.

a) Which algorithm is used for computing the greatest common divisor of two integers? Find out GCD (27, 31) using extended Euclid algorithm.

b) A directed weighted graph is given as below. Find all pair shortest path using Floyd Algorithm.
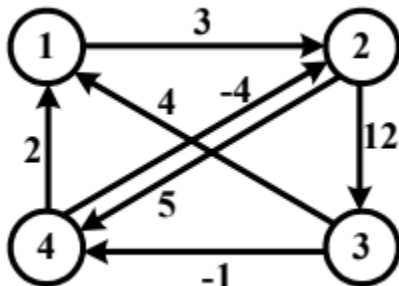
(9+9)

5.

a)   Using algorithm find an optimal parenthesis of a matrix chain product whose sequence of dimension is (3, 2, 5, 3, 4, 4)

b)   What is a max heap? What is a min heap? What are some real life applications of heap? What is the complexity of heap sort?

(9+9)

6.

a)   Explain the main features of Boyer-Moore algorithm.

b)   Solve the following Knapsack Problem using Greedy Algorithm. There are five items whose weights and prices are given in following table. The capacity of the knapsack is 100 kg.

Item	1	2	3	4	5
Weight (kg)	30	40	10	50	20
Price ($)	40	66	20	60	30
Value/weight	1.0	2.2	2.0	1.2	1.5

c)   What do you mean by polynomial time complexity and logarithmic complexity? Which one is higher?

(6+6+6)

7.

a)   Explain Warshall's algorithm using an example.

b)   Explain Traveling salesman problem with example.

(9+9)