Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2022- 23 Examination

Semester: 5 **Date: 10/10/2022**
Subject Code: 203105318 **Time: 10:30 am to 01:00 pm**
Subject Name: Design and Analysis of Algorithms **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

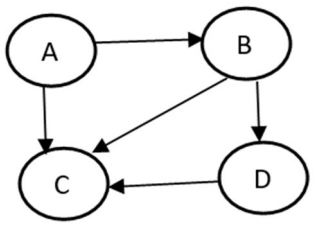
Q.1 Objective Type Questions **(15)**

1. If T1(n) = O(f(n)) & T2(n) = O(g(n)) then T1(n) + T2(n) =max(O(g(n)), O(f(n))). (True/False)
2. Define Minimum spanning tree.
3. What is the time complexity of binary search?
4. Which graph representation is better for dense graph?

5. Choose the incorrect statement about merge sort from the following?
a) it is a comparison based sort
b) it is an adaptive algorithm
c) it is not an in place algorithm
d) it is stable algorithm

6. Let G be a weighted connected undirected graph with distinct positive edge weights. If every edge weight is increased by the same value, then which of the following statements is/are TRUE?
P: Minimum spanning tree of G does not change
Q: Shortest path between any pair of vertices does not change
a) P only
b) Q only
c) Neither P nor Q
d) Both P and Q

7. List out 4 characteristics of algorithm.
8. Can we apply master method on given recurrence relation?(yes/no)
$T(n)= 3T(n/6)+1/n$
9. Write recurrence relation of strassen's matrix multiplication.
10. Which version of algorithm is preferred when memory resources are limited, Iterative or recursive?
11. An asymptotically fast algorithm running on Slow computer is better than asymptotically slow algorithm is running on fast computer for larger input size. (True/False)
12. Torrent Cable Ltd,India wanted to lay cables over the city having locations{A,B,C,D,E}.The team brainstormed to design an algorithm to find the minimum cost to lay the cable over the area. Design a graph according to rubrics given and if the team had preferred a greedy algorithm to find the shortest edge to find out the min cost. What would be the minimum cost incurred?
The travel cost from one location to another are as follows:
A-B is 1, A-C is 7, A-D is 10, A-E is 5,B-C is 3,C-D is 4,D-E is 2
13. Quick sort is stable sort. True / False
14. You are given infinite coins of denominations 1, 3, 4, 5. What is the minimum number of coins required to achieve a sum of 9?
15. Generate topological order for given graph.

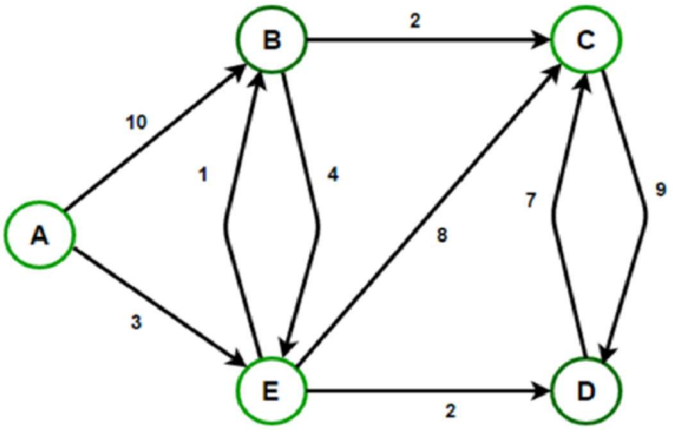


Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Solve the given recurrence relation using recursion tree method.
$T(n) = 2T(n/2) + n$

B) Explain why analysis of algorithms is important? Explain: Worst Case, Best Case and Average Case Complexity with suitable example.

C) Find out shortest path from vertex A to all other vertex, which algorithm will be used (apply greedy approach)? And what will be the optimal Path?



D) Write difference between greedy technique and dynamic programming. Enlist elements of greedy technique.

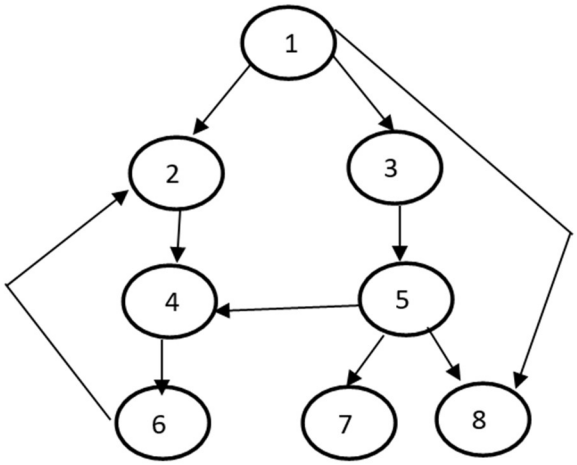
Q.3 A) Find an optimal paranthesization of a matrix-chain product whose sequence of dimensions is 4x10,10x3,3x12,12x20 **(07)**

B) How backtracking can be used to solve N-queens problem. Draw the state space tree for 4 Queens problem. **(08)**

OR

B) Apply merge sort on following input. What is time complexity of merge sort in worst case? Input: 33 11 22 44 99 77 88 66 **(08)**

Q.4 A) Differentiate DFS and BFS traversal of graph. Apply DFS on given graph and identify back edge, cross edge and forward edge. (Consider 1 as a starting vertex) **(07)**



OR

A) Explain P, NP, NP complete and NP-Hard problems. Give examples of each. **(07)**

B) Obtain longest common subsequence for given strings. **(08)**

X= PRESIDENT

Y= PROVIDENCE