

Time: 3 hours

Max. Marks: 80

N.B. (1) Question one is Compulsory.

(2) Attempt any 3 questions out of the remaining.

(3) Assume suitable data if required.

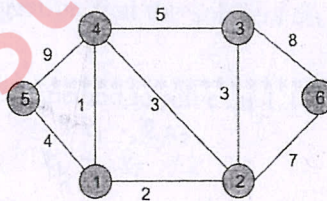


Q. 1

- a) Consider a knapsack with a capacity of $W = 50$. There are 4 items with the following weights and profits: $(P_1, P_2, P_3, P_4) = (60, 100, 120, 80)$ and weights $(w_1, w_2, w_3, w_4) = (10, 20, 30, 40)$. Find the maximum profit and optimal using greedy method. (05)
- b) Write algorithm for binary search and explain its working with an example. (05)
- c) Explain how Graph coloring problem can be solved with backtracking using suitable example. (05)
- d) Solve the following recurrence relations using Master's method. (05)
- $T(n) = 4T(n/2) + n^2$
 - $T(n) = 16T(n/4) + n$

Q. 2

- a) What is an N-Queen problem? Give an algorithm to solve this problem using backtracking method. Explain its working with an example. (10)
- b) Give step by step method to find the Minimum Spanning Tree of the given graph using Prim's Algorithm. Take vertex 1 as the root. (10)



Q. 3

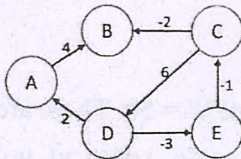
- a) Write an algorithm for Quicksort. Derive and discuss its time complexity for all cases. Explain with an example (10)
- b) What is the 15-puzzle problem? Explain with an example how this can be solved using Branch and Bound. (10)

qp code
83703

prog code
1T00734

Q. 4

- a) Give an algorithm to solve the All-pairs shortest path problem using dynamic programming. What is its time complexity? Find the All-pairs shortest path for all the vertices for the following graph. (10)



- b) Explain the KMP algorithm for string matching with a suitable example. What is the advantage of the KMP algorithm over other string-matching algorithms? (10)

Q. 5

- a) Explain asymptotic notations in detail. (10)
- b) Give an algorithm to find Longest Common Subsequence between two sequences using Dynamic Programming. Also, find the LCS for the following strings: X = "AMERICA" (10)

Y = "ARMENIA"

Q. 6

- a) What is assembly line scheduling? Explain its solution using dynamic programming (10)
- b) Write detailed notes on P, NP, NP-Hard and NP-Complete class of problems. (10)

