SE CMPN sem IV 'c' scheme Summer 2025 Exam. Date - 15/5/25

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: (P1, P2, P3, P4) = (60, 100, 120, 80) and weights (w1, w2, w3, w4) = (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)**

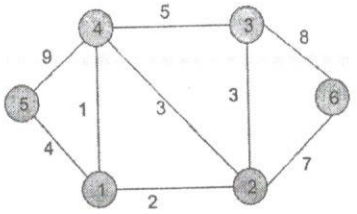
i. $T(n) = 4T(n/2) + n^2$

ii. $T(n) = 16T(n/4) + n$

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)**



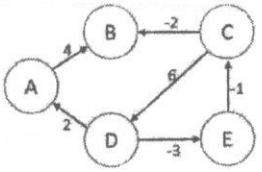
Q. 3

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)**

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)**

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