Total No. of Questions – [06]

Total No. of Printed Pages: 2

G.R. No.	

DECEMBER 2021 - ENDSEM EXAM

T. Y. B. TECH. (E &TC) (SEMESTER - I)

COURSE NAME: Design and Analysis of Algorithms

COURSE CODE: ES31181ET

(PATTERN 2018)

Time: [1 Hour]

[Max. Marks: 30]

Instructions to candidates:

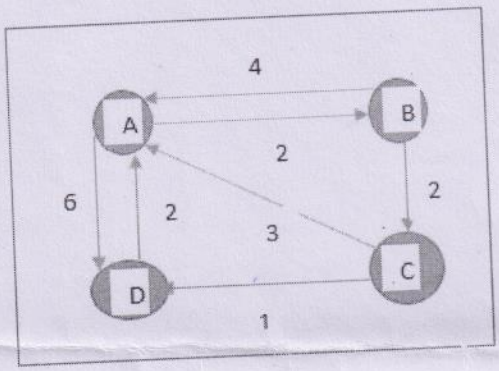
1) Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6.

Q. 1) a) In case of coin changing problem, a person has infinite coins of denominations {1,5,6,9}. Compute the minimum number of coins to generate a sum of 10 using dynamic programming. [4]

b) Consider a 0/1 knapsack problem. Given weights as {2, 3,4, 5}, profit as { 1, 2, 5, 6 } and capacity as 8, compute M(2, 5) element of 2-D array using dynamic programming. [6]

OR

Q. 2) a) Figure below shows a directed graph. Compute the value of $A^1(2, 4)$? [4]



b) In Floyd Warshall algorithm, to compute all pair shortest paths, construct the recursive relation to update adjacency matrix? [6]
Specify the time complexity of Floyd Warshall algorithm.
Compare memoization and tabulation approach.

Q. 3) a) Apply backtracking technique to arrange RGB colors using state space tree. [4]

b) Consider the knapsack instance n= 4 . Profits (p1,p2,p3,p4)= (40,42,25,12), weights (w1,w2,w3,w4)= (2,4,6,9) and capacity m=10. Draw the state space tree and compute the maximum profit using branch and bound method. [6]

OR

Q. 4) a) Compute the total number of nodes in state space tree of 8-queens problem.
Derive the worst case time complexity of N-queens problem when solved using backtracking approach. [4]

b) Consider a travelling salesman problem shown in the diagram below. The diagram shows the cost matrix and reduced cost matrix. Determine shortest path between all the nodes using state space tree. [6]

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

(a) Cost Matrix

$$\begin{bmatrix} \infty & 10 & 17 & 0 & 1 \\ 12 & \infty & 11 & 2 & 0 \\ 0 & 3 & \infty & 0 & 2 \\ 15 & 3 & 12 & \infty & 0 \\ 11 & 0 & 0 & 12 & \infty \end{bmatrix}$$

(b) Reduced Cost Matrix
L = 25

Q. 5) a) Apply reduction technique to reduce multiplication of two matrices to squaring of a matrix. [4]

b) Prove that a clique optimization problem reduces to the clique decision problem. [6]

OR

Q. 6) a) If one instruction is executed every microsecond, compute the time (in seconds) taken by O(n square) algorithm for n = 50? [4]

If one instruction is executed every microsecond, compute the time (in seconds) taken by O(2 power n) algorithm for n = 50?

b) Prove that Clique decision problem is NP Hard problem [6]