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T.E. (Computer) Semester-VI (Revised Course 2007-08)
EXAMINATION Aug/Sept 2019
Modern Algorithm Design Foundation

[Duration : Three Hours] **[Max. Marks : 100]**

Instructions:-
1) Assume Data wherever necessary.
2) Answer any five full questions at least one from each module.

MODULE –I

Q.1 a) What is an algorithm? Discuss the criteria for designing an efficient algorithm. **6**

b) Define Recursive algorithm write a recursive algorithm to print all possible permutations of the given set containing elements $S = \{10,20,30,40\}$. **8**

c) Calculate the space complexity of the following algorithm. **6**

```
float Test (a,b,c)
{
    return (a + b+b*c +(a +b- c ) / (a+b) +4.0)i
}
```

Q.2 a) Prove the following with respect to the problem size n **4**

i) $6 * 2^n + n^2 = O(2^n)$

ii) $10n^2 + 4n + 2 = \Omega(n^2)$

b) Show strassen's Matrix multiplication process on the following matrices A and B **6**

$A = \begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 3 \\ 6 & 5 \end{bmatrix}$

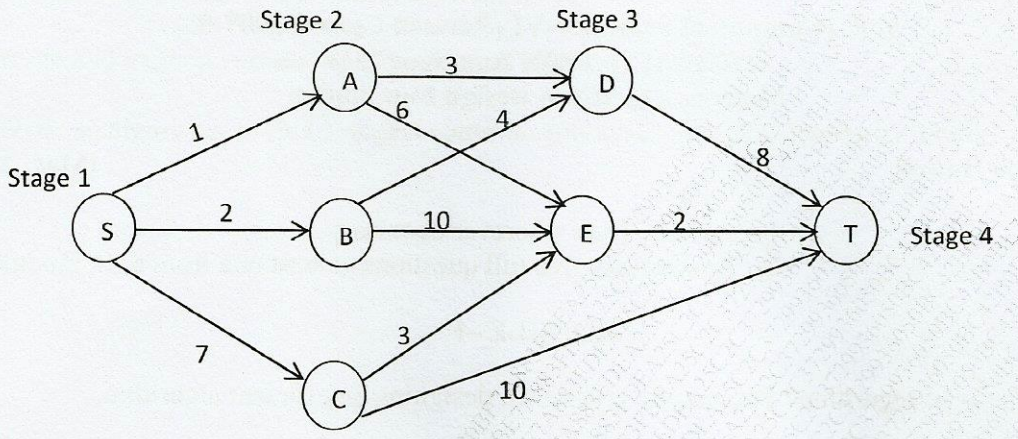
c) Explain the control abstraction for Divide and conquer technique **4**

d) With suitable example, prove that the algorithm to find the smallest and largest element in an array using divide and conquer strategy is better than Naive algorithm. **6**

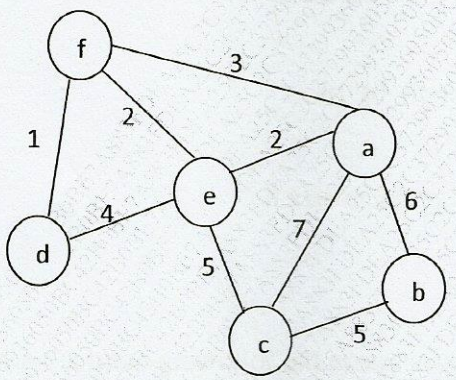
MODULE – II

Q.3 a) Find the optimal solution for the given knapsack instance using greedy strategy **6**
n=5 , P(1…..5) = (10,15,8,6,7) , w (1….5) = (4,6,3,4,2) with the knapsack of capacity 12

b) Write an algorithm for forward approach of multistage graph illustrate your algorithm with the help of the following graph. **8**



c) Using Dijkstra shortest path algorithm find the shortest path from vertex 'd' to all other vertices and state it complexity **6**



Q.4 a) Construct a Optimal Binary search tree for the given set containing 4 elements $(a_1, a_2, a_3, a_4) = (10,22,34,45)$ and probabilities are P(1…4) = (3,3,2,4) and $Q(0 \ldots 4) = (1,2,1,3,2,2)$ **10**

b) Explain the control abstraction for the Greedy strategy. **3**

c) State the principal of optimality **2**

d) Consider the following 4 jobs with their processing time on a two machine system. **5**

Jobs	M_1	M_2
J_1	3	2
J_2	0	3
J_3	4	2
J_4	5	2

i) Obtain a dynamic programming formulation to determine the minimum time needed to process all the jobs.

ii) Compute the Mean Finish Time, Finish time for each job.

MODULE –III

Q.5 a) Write the algorithm for N- Queens problem Draw solution space for 4 Queens problem. **6**

b) Solve the following instance of 0/1 knapsack problem by using branch and bound technique where n=4 W (1,2,3,4) = (9,5,7,2) V(1,2,3,4) = (15,6,5,1) m=16 . **8**

c) With the help of an example explain the concept of Hamiltonian cycle in a graph Develop a backtracking algorithm that finds all possible Hamiltonian cycles in the graph **6**

Q.6 a) Write an backtracking algorithm for sum of subset problem. **6**

b) Explain the principle of FIFO branch and bound. **4**

c) Explain the implicit and explicit constraint for sum of subset problem. Solve the following problem using backtracking approach to find sum of subset. **10**

$$W = \{ 5,7,10,12,15,18,20 \}\ M = 25$$

Draw the state space tree.

MODULE- IV

Q.7 a) Implement Brute force algorithm on the following to check whether pattern is present in text or not **5**

Text : it is a rainy day

Pattern : day

b) Explain the following with respect to multicast algorithm **6**

i) Center Based Tree's

ii) Steiner Trees

c) Explain leader electron in a tree in a asynchronous model. **5**

d) Write an algorithm to compute Failure Function in KMP algorithm **4**

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Q.8 a) Draw standard trie and its compact representation for the following set of strings. **8**
{ bear, bell, bid, bull, buy, sell, stock ,stop }

b) Write and explain complexity measures of Network Algorithms **6**

c) Write an algorithm to find Longest common subsequence in text similarity Testing. **6**