15617

MCA 4th Semester Examination

Fundamental of Computer Algorithms (NS)

MCA-401

Time : 3 Hours   **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question each from the section A, B, C and D. Each question is of 12 marks. Section E is compulsory and carries 12 marks in all.
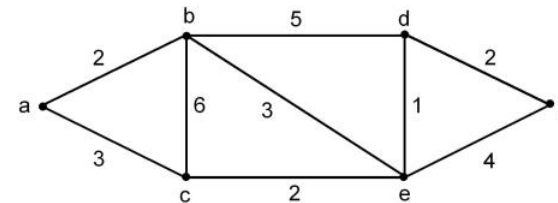
SECTION - A

1. (a) Explain various asymptotic methods used to represent the rate of growth of running time of algorithms.   (6)

   (b) What is Heap? Construct a Heap with the following list of elements:

        3,7,2,1,9,8,6,4,11,13,5   (6)

2. (a) Analyze the running time of the following segment:

        for (i=1; i<=n; i++)

        for (j=n; j>=1; j– –)

           sum++;   (6)

   (b) How recursive algorithms are analysed? Analyze the execution time of recursive algorithm for tower of Hanoi problem.   (6)
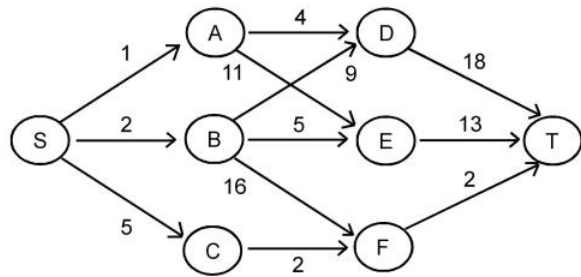
SECTION - B

3. (a) How to solve knapsack problem using greedy method. Explain with suitable example.   (6)

   (b) Define Quick sort. And show the various steps involved in the quick sorting of

        1,3,4,11,9,2,6,5,3.   (6)

4. (a) Solve the following recurrence relations

        $T(n) = 2T(n/2) + n$ (6)

   (b) What is the difference between Prims algorithm and Kruskals algorithm for finding the minimum spanning tree of a graph? Execute Prim's algorithms on the given graph.   (6)

SECTION - C

5. (a) Find an optimal solution for the 0/1 knapsack instances

        n=3, (w1,w2,w3)=(2,3,4), (p1,p2,p3)=(1,2,5) and m=6.   (6)

   (b) What is Keliability design problem? How dynamic programming method can be used to solve this problem?   (6)

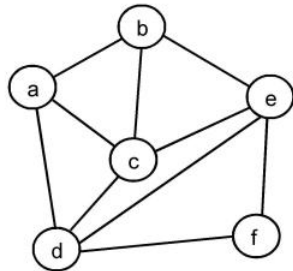6. (a) Find a minimum cost path from S to T in the Multistage graph given on next page:

(6)

(b) How many connected components are in an undirected graph possible using breadth first search? Give an algorithm. (6)

SECTION - D

7. (a) Find a Hamiltonian cycle of the graph given below using backtracking–

(6)

(b) Write an algorithm that can solve n-queens problem and also analyse its running time. (6)

8. (a) Write an algorithm to solve sum of subsets problem using backtracking and also analyse its complexity. (6)

(b) Prove that the k- colourability problem is NP-complete even if k is restricted to 3 and the maximum degree of any vertex is 4. (6)

SECTION - E

9. (a) How is the efficiency of the algorithm defined?

(b) Find the O-notation for the functions–

$f(n) = 5n^3 + n^2 + 6n + 2$

(c) What is the divide and conquer method?

(d) How greedy method is different from dynamic programming?

(e) What is travelling salesman problem?

(f) Define NP hard and NP complete problem. (2×6=12)