College of Engineering, Pune

END SEMESTER EXAM 2012

Final B. Tech

EE 413- Computer Algorithms

Day & Date- 03/12/12 Max. Marks- 50

Timing - 2pm to 5pm Duration – 3 hours

Instructions:

1. Assume Data wherever necessary.
2. Solve any **Five (5)**.
3. Figures and examples with proper explanation fetch full marks.

Marks

Q. 1 Solve the following for the given Algorithms (below): **10**

(i) Introduce statements to increment *count* at all appropriate points in Algorithm given below.

(ii) Simplify the resulting algorithm by eliminating statements. The simplified algorithm should compute the same value for *count* as computed by the algorithm of Part (i)

(iii) What is the exact value of *count* when the algorithm terminates? You may assume that the initial value of *count* is 0.

(iv) Obtain the step count for following Algorithm using the frequency method. Clearly show the **step count table**.

```
Algorithm D(x, n)
{
    i := 1;
    repeat
    {
       x[i] := x[i] + 2;
       i := i + 2;
    } until (i < n);
    i := 1;
    while ( i ≤ ⌊n/2⌋) do
    {
        x[i] := x[i] + x[i + 1];
        i := i + 1;
    }
}
```

```
Algorithm Mult(a, b, c, m, n, p)
{
    for i := 1 to m do
    {
        for j := 1 to p do
        {
            c[i, j] := 0;
            for k := 1 to n do
                c[i, j] := c[i, j] + a[i, k] * b[k, j];
        }
    }
}
```

Q. 2 *A.* Explain the Algorithm for Finding the Maximum and Minimum using Divide and Conquer techniques. Show Time and Space complexity. **05**

B. Give a proof that shows the recurrence relation $T(n) = mT(n/2) + an^2$ is satisfied by $T(n) = O(n^{\log m})$. **05**

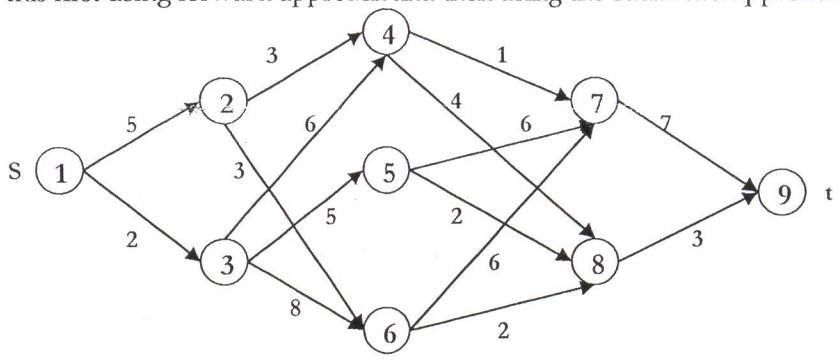
Q. 3 *A.* Present a backtracking algorithm for solving the knapsack optimization problem using the variable tuple size formulation. **06**

B. What do you mean by Depth First Search Traversal? Explain in brief. **04**

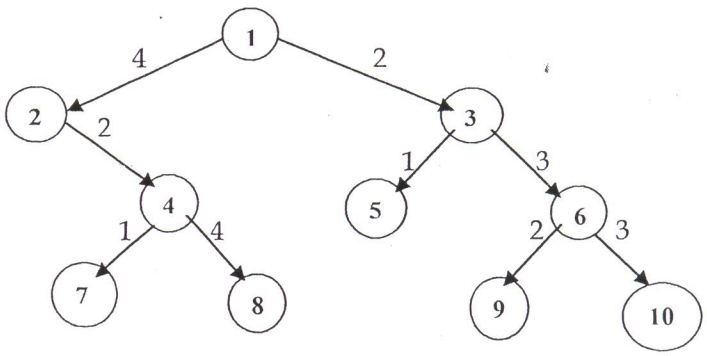
Q. 4 A. You are given a set of n jobs. Associated with each job i is a processing time t_i, and a deadline d_i, by which it must be completed. A feasible schedule is a permutation of the jobs such that if the jobs are processed in that order, then each job finishes by its deadline. Define a greedy schedule to be one in which the jobs are processed in non-decreasing order of deadlines. Show that if there exists a feasible schedule, then all greedy schedules are feasible. 06

B. What is the solution generated by Job Scheduling (JS) Algorithm when $n = 7, (p_1, p_2, \ldots, p_7) = (3, 5, 20, 18, 1, 6, 30)$ and $(d_1, d_2, \ldots, d_7) = (1, 3, 4, 3, 2, 1, 2)$? 04

Q. 5 A. Find a minimum-cost path from s to t in the multistage graph of Figure shown below. Do this first using forward approach and then using the backward approach. 06



B. For the following tree, solve the TVSP when (a) $\delta = 4$ and (b) $\delta = 6$. 04



Q. 6 A. Explain *QuickSort* Algorithm. Write Partition algorithm. 06

B. Explain All-Pairs Shortest Paths problem. Solve it using Dynamic Programming Technique. 04

Q. 7 A. Explain Tree Traversal Techniques, and write Algorithms for these techniques. 06

B. Explain Graph Coloring Problem. How an optimum solution can be generated using Backtracking Method? 04