Algorithms - (M.Tech CS and Ph.D)
Assignment - 3 Submit by 4 October 2017

26 September 2017

- For greedy strategy: clearly spell out the greedy criterion and write the candidate list on which the criterion is applied. The algorithm is run till you find no more candidates. Explanation should reflect these ideas.

- For all questions, write the algorithm, give an argument for correctness and trace it on a non-trivial example.

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1. Given n activities $(a_1, a_2, \ldots, a_n)$ with starting and finishing times respectively as (s_i, f_i) for job i $1 \leq i \leq n$. Two jobs are said to conflict if there is a point in time when both jobs are active. In other words, if $s_i < s_j < f_i$ or $s_j < s_i < f_j$. Develop a greedy algorithm to find a subset of k non-conflicting activities with k as large as possible.

2. Consider a set S of $n \geq 2$ distinct numbers given in unsorted order and, x and y are two distinct numbers in the set S. Write an $O(n)$ time algorithm to determine $x, y \in S$ such that $|x - y| \geq |w - z|$ for all $w, z \in S$.

3. Modify Dijkstra's algorithm for finding shortest paths from a source such that out of all the minimum weighted paths, it outputs the one that has least number of edges. Explain. Trace your algorithm on an example.

4. Compute Binomial coefficients nC_r, n and r are positive integers with $r \leq n$ using dynamic programming strategy. Explain the principles of the strategy: optimality principle, overlapping subproblems and the recurrence relation using which the solution is computed.