MSE 2011 Second B.Tech CSE CS204 Algorithms

Time:-2hours MM: 44

---

1. (a) Prove that any comparison SORT algorithm requires $\Omega(n \lg n)$ comparison in worst case. [4]

(b) What is a stability property in Counting Sort algorithm? [2]

(c) Why the time complexity of Counting Sort algorithm beats the lower bound of sorting? [2]

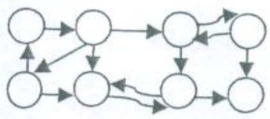
2. (a) Suppose the partitioning algorithm of Quick sort always produces a 9-to-1 proportional split (unbalanced case). Obtain the recurrence on the running time of Quick sort and find out its running time. [5]

(b) Is the array with values <23,17,14,6,13,10,1,5,7,12> a max-heap? [2]

3. (a) State the Matrix-Chain-Multiplication problem. [1]

(b) Using Amortized Analysis, show that for n increment operations in incrementing a binary counter, the total amortized cost is $O(n)$. [4]

4. Consider the directed graph G.



(a) Call dfs(G) to compute finishing time for each vertex u.f. [3]

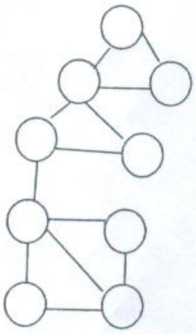
(b) Compute transpose of G, say G^T. Call dfs(G^T), considering vertices in order of decreasing u.f (obtained in step(a)). [3]

(c)Obtain the strongly connected components (SCC) of G. [3]

(d) Obtain the component graph $G^{SCC}(V^{SCC},E^{SCC})$. [2]

(e) Obtain the topological sorting of G^{SCC}. [3]

5. Consider the following graph G and use your dfs algorithm [2]



(a) Find out all the articulation points of G. [4]

(b) Find out all the biconnected components of G. [4]