Please write your Exam Roll No.) Exam Roll No. 00555102716

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: ETCS-301 **Subject: Algorithm Design and Analysis**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt all questions as directed. Internal choice is indicated.

Q1 (a) Define Big O, Small O and Small w notation with examples? (2.5)
(b) Define iteration method with example? (2.5)
(c) Explain hashing and elaborate its advantages over linear and binary search? (2.5)
(d) What do you mean by optimality and correctness of algorithm? (2.5)
(e) Compare knapsack problem in Greedy, Dynamic and any other approach (backtracking) and give the different perspectives? (2.5)
(f) Explain polynomial time verification problems with an example? (2.5)
(g) Compare MCM problem with memorization and recursive MCM? (2.5)
(h) Define binomial Coefficient? (2.5)
(i) Define NP hard and NP complete with example? (2.5)
(j) Which string matching algorithm is better and when? (2.5)

Q2 (a) Let N is number of guests attending party. If each of guests shakes hand with everyone else only once. How many handshakes will take place? Write recursive definition and algorithm? (4)
(b) Quick sort is not a stable sorting algorithm. If key in a[i] is changed to a[i]*n+i-1, then new keys are all distinct. After sorting which transformation will restore the keys to their original values? (4.5)
(c) Sort the following numbers using Merge sort? The set is (50,10,20,30,15,70,35,55) (4)

OR

(a) Let S be a sample of s elements from X. If X is partitioned into s+1 parts as in algorithm Rsort given below. Then show that size of each part is Big-O(n/s log n)

Algorithm Rsort(a,n)
{randomly sample s elements from a[];
Sort this sample;
Partition input using sorted samples as partition key;
Sort each part separately;} (6.5)

(b) Solve recurrence (3)
$T(n) = 1$ $n<=4$
$T(n) = T(n^{1/2})+c$ $n>4$

(c) Prove by induction (3)
$\sum i=0...n\ xi=(x^{n+1}-1)/x-1$ $x<>1$ for $x>=0$

Q3 (a) Find optimal binary Merge pattern for 10 files whose lengths are given in the set S, (28,32,12,5,8,4,53,91,35,3,11). Show that if all internal nodes in a tree have degree k, then number n of external nodes is such that n mod(k-1)=1. Draw optimal 3 way merge tree obtained using rule area when (q1..q11)=(3,7,8,9,15,16,18,20,23,25,28). (7.5)
(b) The jobs are scheduled on 3 processors. The task times are given by matrix J as follows J=[2 0 ; 3 3 ; 5 2]. Draw two possible schedules. (5)

OR

P.T.O.

Q5 (a) Show that knapsack optimization problem reduces to knapsack de problem when all the P's, W's and m are integers and complexity is measured as a function of input length. If input length then $\sum pi <= n^2$, where n is no. of objects.

(b) Show job sequencing with deadlines problem is NP-hard?

(c) How we count the number of parenthesis in MCM Problem. Use substi method to show solution to recurrence is (2^n). Assume symbol as omega

Q6 (a) Give $O(n^2)$ time algorithm to find longest monotonically incre subsequence for n numbers?

(b) How task scheduling problem is solved using matroids. If S is set of time tasks with deadlines and I is set of all independent tasks then that corresponding system (S,I) is matroid.

(c) Explain Floyd Warshall algorithm and explain its time complexity.

OR

Q7 (a) Professor George proposes new divide and conquer algorithm for comp Minimum Spanning tree(MST). If graph is partitioned into 2 sets V1 an Let E1 and E2 are set of edges that are incident only on vertices in V1 V2. Recursively solve MST problem on each of two sub-graphs G1(V and G2(V2,E2). Finally select minimum weight edge in E that cr cut(V1,V2) and use this edge to unite the resulting two minimum span trees into a single spanning tree. Sets V1 and V2 differ by maximum 1.

(b) How would you extend Robin karp Method to problem of searching a string for an occurrence of anyone of given set of k patterns. Assume patterns have some length Generalize your solution for different pa strings.

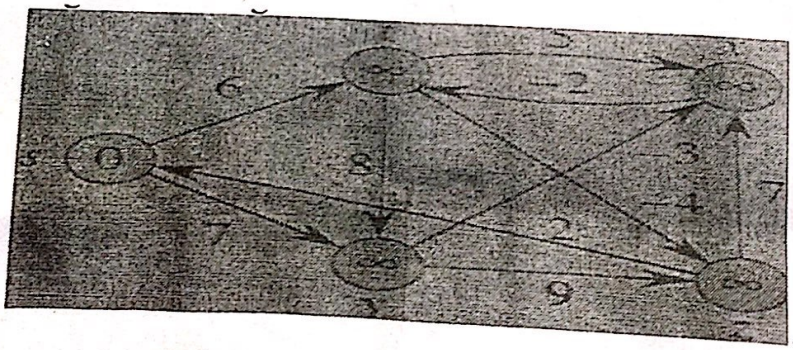
Q8 (a) Illustrate String matching with Finite automata?

(b) Give pseudo code to reconstruct LCS from completed c table and orig sequences $X=(x1,x2,x_n)$ and $Y=[y1,y2,\ldots,y_n)$ without using b table in O(r time. Give its memorized version.

OR

Q9 (a) Let G be a connected undirected graph with n vertices. Show G must hav least n-1 Edges and that all connected and undirected graphs with edges are trees. What is minimum no. of edges in a strongly conne digraph with n vertices? What from do such digraphs have?

(b) Give properties of shortest path and relaxation. Run bellman ford algori on directed Graph. In each pass, relax edges in the same order as in fig Using vertex z as source, show d and pi values after each pass. now cha the weight of edge(z,x) to 4 and run algorithm using s as source.



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