(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1075 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2010-11

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **all** questions.

(2) All questions carry equal marks.

1. Attempt any **four** parts of the following :— **(5×4=20)**

(a) Determine the asymptotic order of the following functions :

(i) $f(n) = 6 \cdot 2^n + n^2$.

(ii) $f(n) = 7$.

(b) Solve the recurrence relation $T(n) = 2T(\sqrt{n}) + 1$ whenever n is a prefect square greater than 1 and $T(2) = 3$.

(c) Solve the recurrence relation using Master's Theorem :

$T(n) = 7T(n/2) + 18n^2$, where $n \geq 2$ and a power of 2.

(d) Write quick sort algorithm. Prove that the running time complexity of quick sort is O(n log n) in average.

(e) You are given an array of n integers $a_1 < a_2 < \ldots\ldots a_n$. Give an O(log n) algorithm that finds index i where $a_i = i$ or prove that such i does not exist.

(f) Describe Heap sort algorithm.

2. Attempt any **two** parts of the following :— **(10×2=20)**

(a) Show the Red black tree that is to be resulted after successively inserting the keys 41, 38, 31, 12, 19, 8 into an initially empty red black tree.

(b) Define a B-tree of order m. Let $d = \lceil m/2 \rceil$ and let n be the number of elements in the B-tree. Show that

$$2d^{h-1} - 1 \leq n \leq m^h - 1$$

where h is the height of the B-tree.

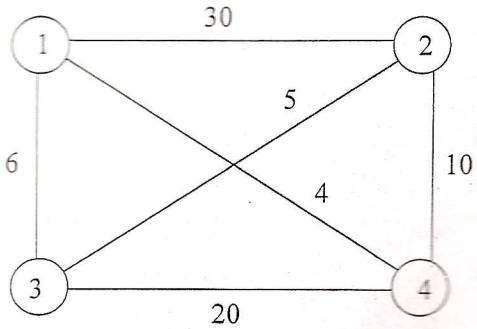
(c) Define Fibonacci heap. Differentiate between Binomial and Fibonacci heap.

3. Attempt any **two** parts of the following :— **(10×2=20)**

(a) Describe greedy method. Find the optimal solution to the Knapsack instance n = 3, W = [100, 14, 10], P = [20, 18, 15] and C = 116 using greedy method.

(b) Obtain the dynamic programming recurrence equations for the 0/1 Knapsack problem of n instances. Assume suitable data for n instances Knapsack.

(c) Consider a four vertex network as shown below. Find a least cost tour using backtracking method.

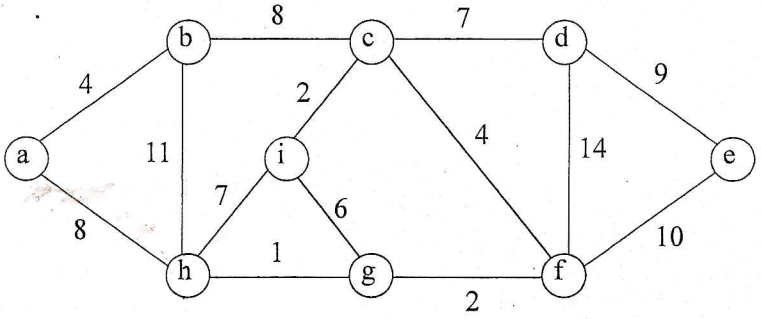


4. Attempt any **two** parts of the following :— **(10×2=20)**

(a) Use Strassen's algorithm to compute the product of two given matrices :

$$\begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} \text{ and } \begin{bmatrix} 8 & 4 \\ 6 & 2 \end{bmatrix}.$$

(b) Find the minimum cost spanning tree of the given graph using Prim's algorithm.



(c) Describe Floyd Warshal's algorithm to find all pairs shortest paths in a directed network.

5. Write short notes on any **four** of the following :— **(5×4=20)**

(a) NP-Completeness.

(b) Randomized algorithms.

(c) Branch-and-Bound algorithm.

(d) Approximation algorithms.

(e) Hamiltonian cycle problem.

(f) Chromatic Number.