D 42580 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2007

CS 04 704—DESIGN AND ANALYSIS OF ALGORITHMS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

I. 1 Write the algorithm for Quick sort.

2 Let $f(n)$ and $g(n)$ be asymptotically nonnegative functions. Using the basic definition of Θ -notation, prove that max $f(n)$, $g(n) = \Theta(f(n) + g(n))$.

3 What is an optimal Huffman code for the following set of frequencies, based on the first 8 Fibonacci numbers ?

$a : 1\ b : 1\ c : 2\ d : 3\ e : 5\ f : 8\ g : 13\ h : 21$

Can you generalize your answer to find the optimal code when the frequencies are the first n Fibonacci numbers ?

4 Use Strassen's algorithm to complete the matrix product.

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

Show your work.

5 Write short notes on Co-NP.

6 Explain the Cook's theorem.

7 Write short notes on primality testing.

8 Describe any *two* applications of cryptography.

(8 × 5 = 40 marks)

Part B

Answer **one** *question from each unit.*

II. 1 Explain the probabilistic analysis for any *two* problems.

Or

2 Illustrate the operation of Heap sort on the array A = (5, 13, 2, 25, 7, 17, 20, 8, 4, 69, 110, 77) and also write the complete algorithm for heap sort.

III. 1 Explain the optimal binary search tree in detail.

Or

2 Write the Prim's and Kruskal's algorithm to construct MST. Compare the running time of both the algorithms.

Turn over

IV. 1 Show that TSP and clique are NP-complete.

Or

2 Write the approximation algorithm for the set covering problem. Show that the decision version of the set covering problem is NP-complete by reduction from the vertex cover problem.

V. 1 Explain the Monte-Carlo algorithm in detail.

Or

2 Explain about the universal hashing and Dixon's integer factorization algorithm.

(4 × 15 = 60 marks)