MCA (Revised)

Term-End Examination

June, 2009

12611

MCS-031 : DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 hours *Maximum Marks : 100*

Note : *Question No. 1 is **compulsory**. Attempt **any three** questions from the rest.*

1. (a) (i) Enumerate five important characteristics of an Algorithm. **4**

(ii) Write a recursive procedure to find the sum of first n natural numbers. **4**

(b) (i) State Travelling Sales Persons problem. Comment on the nature of solution to the problem. **4**

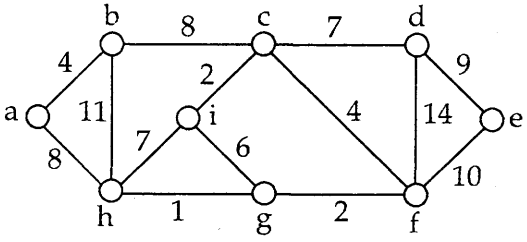
(ii) You are given stamps of value Rs. 5 and Rs. 6. Show that any amount $\geq$ Rs. 20 can be realized using stamps of Rs. 5 and Rs. 6. Use Mathematical Induction for the proof. **4**

(c) (i) Write the non-recursive binary search procedure. 4

(ii) Solve the recurrence 4

$$T(n) = 2T\left(n/2\right) + n \quad n \geq 2$$
$$= 1 \quad n < 2$$

(d) (i) Obtain the minimum cost spanning tree for the following graph using PRIMS algorithm. 4



(ii) Obtain the BFS tree for the above graph, given in d (i). 4

(e) (i) Write a context free grammar to generate palindromes of even length Over alphabet $\Sigma = \{a, b\}$. 4

(ii) Write the finite automata corresponding to the regular expression (a+b)*ab. 4

2. (a) Derive the principle of optimality for multiplication of matrix chain. 5

(b) Compute the optimal no. of scalar multiplications required to multiply the following matrices. **10**

A1 of order 30×35

A2 of order 35×15

A3 of order 15×5

(c) Give the list in each iteration for sorting the list 90, 42, 41, 120, 60, 50 using selection sort. **5**

3. (a) Explain the Chomsky's Classification of grammars. **10**

(b) What is an ambigous grammar ? How do you prove that a given grammar is ambigous ? Explain with an example. **10**

4. (a) If L_1 and L_2 are context free languages then, prove that $L_1 \cup L_2$ is a context free language. **5**

(b) Define Pushdown Automata. **5**

(c) Explain Decidable and Undecidable problems. Give example for each. **10**

5. (a) Construct a turing machine that copies a given string over {a, b}. Further find a computation of TM for the string 'aab'. **10**

(b) Explain the importance of asymptotic analysis for running time of an algorithm. **5**

(c) Write a note on NP-hard problems. **5**

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