

MCA-404(N)

M. C. A. (Fourth Semester) EXAMINATION, June, 2008

(New Course)

DESIGN AND ANALYSIS OF ALGORITHMS

[MCA-404(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt *one* question from each Unit. All questions carry equal marks.

Unit-I

1. (a) What do you understand by the complexity of an algorithm ? How it is helpful in analysing the algorithm ? 2, 4
- (b) Show that $g \in o(f)$ but $f \notin o(g)$ when $f(n) = \frac{1}{2}n^3$ and $g(n) = 37n^2 + 120n + 17$. 4
- (c) Classify the data structures into linear and non-linear. Discuss *one* of each type. 2, 4, 4
2. (a) What are various methodologies for analysing the algorithm ? Discuss *one* methodology in detail. 8
- (b) What is the role of asymptotic behaviour of the functions in computing algorithm ? What notations are used for this purpose ? 4, 4

P. T. O.

- (c) State the relationships between algorithm and data structure. 4

Unit-II

3. (a) What is divide and conquer technique ? Using quick-sort algorithm, arrange the following array in ascending order ? Give the complexity of the algorithm used :
[310, 285, 179, 652, 351, 423, 861, 254, 450, 520]
2, 4, 4
- (b) Design binary search algorithm to find x in an ordered list. Do its worst case and average behaviour analysis. How do you modify this algorithm to eliminate the unnecessary work, if you are sure that x is in the list. 4, 4, 2

4. (a) Write Strassen's algorithm of matrices multiplication and prove that it does $6n^{2.81} - 6n^2$ multiplication operations on matrix entries where n is power of 2. 4, 6
- (b) Write Depth First Search and Breadth First Search algorithms for traversing a diagraph. Find their complexities also. 5, 5

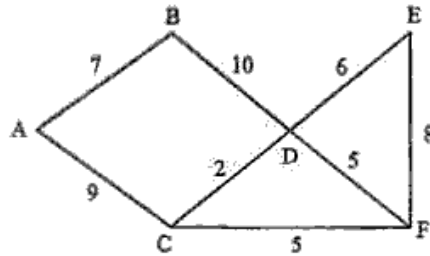
Unit-III

5. (a) What are the characteristics of branch and bound algorithm ? Draw the portion of state space tree generated by LC Branch and Bound for the following knapsack instances : 3, 7

$$n = 4 \quad (P_1, P_2, P_3, P_4) = (10, 10, 12, 18)$$

$$m = 15 \quad (w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$$

- (b) What are general characteristics of Greedy algorithm ? Show the snapshots of Prim's and Kruskal's algorithm for finding the minimum weight spanning tree of the following graph. 2, 4, 4



6. (a) What are the principles of greedy technique ? Discuss one algorithm with one example based on this technique. 3, 7
- (b) State the Branch and Bound methods for designing the algorithm. Solve IS-puzzle problem using this method. 4, 6

Unit-IV

7. (a) Distinguish between Dynamic Programming and Divide and Conquer methods. 4
- (b) Use Dynamic Programming approach to solve Travelling Salesman problem. 8
- (c) Find longest common subsequences of the following sequences : 8
- $X = \langle A, B, C, B, D, A, B \rangle$
- $Y = \langle B, D, C, A, B, A \rangle$
8. (a) What is 8-queen problem ? Solve it using back-tracking. 10

P. T. O.

- (b) Use dynamic programming method to find the sequence in which the following chain of matrices should be multiplied to minimize the computation time : 10
- $A (20 \times 2) \times B (2 \times 15) \times C (15 \times 40) \times D (40 \times 4)$
- ($x \times y$) represents dimensions of matrix.

Unit-V

9. (a) List the values in charjump and matchjump arrays for the Boyer-Moore algorithm for the following pattern assuming alphabets (A, B, ..., Z) : 8
- ABRACADABRA
- (b) Describe Horner's method of polynomial evaluation. Find the factors of the polynomial : 7
- $p(x) = x^7 + 2x^6 + 6x^5 + 3x^4 + 7x^3 + 5x + 4$
- that result from Horner's method.
- (c) Differentiate between polynomial and non-polynomial time complexity. 5
10. (a) Write Boyer-Moore algorithm for string matching and implement it for pattern P and text T given as follows : 5, 5
- P : IF # YOU # WISH # TO # UNDERSTAND # OTHERS # YOU # MUST
- T : STAND
- # — indicates blank space between words.
- (b) Discuss in brief any two of the following : 5 each
- (i) Combinational algorithms
- (ii) Algebraic algorithms
- (iii) Set algorithms