

# END-TERM EXAMINATION

DECEMBER 2006

**Paper Code : MCA-205** **Subject: Design and analysis of algorithm**

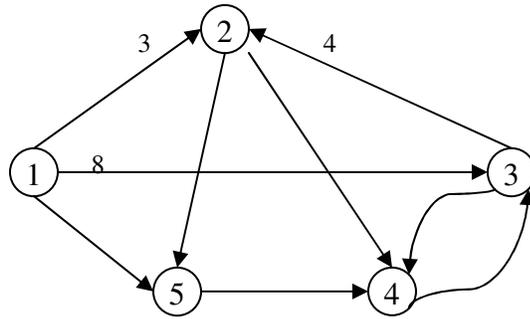
**Time: 3 Hours** **Maximum Marks: 60**

**Note: Attempt all question as directed. All questions have internal choice.**

- Q. 1. Attempt any four parts :- **(3 x 4 =12)**
- (a) Solve the recurrence relation by iteration  $T(n) = T(n-1) + n^4$ .
  - (b) Show that the solution of  $T(n) = T(\lfloor n/2 \rfloor) + 1$  is  $O(\log n)$ .
  - (c) Apply quick sort algorithm on the following list 10, 2, 12, 7, 4, 6, 9, 5, 1, 3, 11, 0.
  - (d) Show that the merge sort algorithm follows divide and conquer paradigm.
  - (e) Write an algorithm for linear search and find its complexity.
  - (f) What is stable algorithm?
- Q. 2. Attempt any three parts:- **(4 x 3 =12)**
- (a) Find the longest common subsequence of  
Author-affil refers to the affiliation of author  
 $X = \langle A, B, C, D, A, B \rangle$   
 $Y = \langle B, D, C, A, B, A \rangle$
  - (b) Construct the Huffman codes for first eight Fibonacci number.
  - (c) Compare dynamic programming and divide and conquer paradigm.
  - (d) Let  $n = 5$ ,  $(P_1, P_2, \dots, P_5) = (20, 15, 10, 5, 1)$  and  $(d_1-d_5) = (2, 2, 1, 3, 3)$ .  
Find the optimal schedule.
  - (e) Write three operations and their implementation on disjoint sets.
  - (f) What is optimal binary search tree?
- Q. 3. Attempt any two parts :- **(6 x 2 =12)**
- (a) Suppose the dimensions of matrices A, B, C, D are  $20 \times 2$ ,  $2 \times 15$ ,  $15 \times 40$  and  $40 \times 4$  respectively. What will be the optimum number of scalar multiplications?
  - (b) Write Dijkstra algorithm to solve single source shortest path problem and analyze its time-complexity.
  - (c) How the Bellman-ford algorithm is used to detect the presence of negative edge cycle in the given graph?

Q. 4. Attempt any two parts :- **(6 x 2 =12)**  
 (a) Write PRIM's algorithm for finding out minimum spanning tree and derive its complexity.

(b) Use Floyd –Warshall's algorithm to find the shortest path between all pair of vertices in the graph?



(c) Give the Knuth-Morris-Pratt algorithm for pattern matching. Discuss its performance and failure functions.

Q. 5. Attempt any two parts :- **(6 x 2 =12)**

(a) Discuss the Strassen's algorithm for matrix manipulation. Show that two  $n \times n$  matrices can be in  $\theta(n^{\log_2 7})$  time..

(b) Prove that satisfiability of Boolean formula in 3-conjunctive normal form (3-CNF) is NP-Complete.

(c) Analyze the time complexity of Rabin-Karp algorithm.

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