(b) Generate all permutations of { a, b, c, d } using back-tracking.

Or

(a) Solve the following 0/1 Knapsack problem using dynamic programming :

P = (11, 21, 31, 33), W = (2, 11, 22, 15), C = 40, n = 4

(b) What is dynamic programming technique ? How does it differ from divide and conquer technique ?

(c) Find the longest common subsequences of the strings "add aac aed bac" and "aad cc adba" using dynamic programming technique.

Unit – V

5. (a) What do you understand by NP-Hard and NP complete problem ? Write in brief about non-deterministic algorithm.

(b) Show that the following problem is NP-complete :

Maximum Common Subgraph :

Input : Two graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ a budget b.

Output : Two set of nodes $V_1' \subseteq V_1$ and $V_2' \subseteq V_2$ whose deletion leaves at least b nodes in each graph and makes the two graphs identical.

Or

(a) What do you understand by clique ? Show that the clique optimization problem reduces to the clique decision problem.

(b) Write short notes on the following :

(i) Algebraic algorithm

(ii) Combinational algorithms

Total No. of Questions : 5] [Total No. of Printed Pages : 4

MCA–404(N)

M. C. A. (Fourth Semester) EXAMINATION, June, 2007

(New Course)

DESIGN AND ANALYSIS OF ALGORITHMS

[MCA – 404 (N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Question paper is divided into *five* Units. There is internal choice in each Unit. Attempt *one* question from each Unit. All questions carry equal marks.

Unit – I

1. (a) Write a recursive algorithm to find the sum of n elements of an array and determine the step count for your algorithm.

(b) Check the correctness of the following equalities :

(i) $3n + 3 = \theta(n)$

(ii) $n^2 \log n = \theta(n^2)$

(iii) $n^3 + 10^5 n^2 = \theta(n^3)$

Or

(a) Write linear search algorithm for an unsorted array. Also perform worst case analysis and average case analysis.

(b) If $f(n) = a_m n^m + a_{m-1} n^{m-1} + \ldots a_0$ then prove that :

$$f(n) = O(n^m)$$

(c) Prove that :

$$10 n^2 + 4n - 2 = O(n^2)$$

Unit – II

2. (a) Solve the following recurrence $T(n) = 7T(n/2) + 3n^2$ where n is a power of 2 and is greater than one.

(b) Write Strassen's matrix multiplication algorithm as well as the classical $\theta(n^3)$ one. Determine when strassen's method outperforms the classical one. Show how the following matrices would be multiplied using Strassen's algorithm : $\begin{bmatrix} 7 & 9 \\ 2 & 5 \end{bmatrix}$ and $\begin{bmatrix} 3 & 2 \\ 6 & 5 \end{bmatrix}$.

Or

(a) Write quick sort algorithm and determine the average case time requirement and worst case time requirement for the same.

(b) Design a linear time algorithm which, given an undirected graph G and a particular edge e in it. Determine whether G has a cycle containing e.

Unit – III

3. (a) What are the general characteristics of Greedy algorithms and the problems solved by these algorithms ? Give Kruskal's algorithm for finding minimum cost spanning tree. Perform complexity analysis.

(b) Solve the Travelling Salesmans problem having the following cost matrix using branch and bound technique :

	A	B	C	D
A	X	5	2	3
B	4	X	1	5
C	4	2	X	3
D	7	6	8	X

Or

(a) Write LC-search algorithm and establish the correctness of your algorithm.

(b) Consider the following graph using Kruskal's algorithm and determine MST of the graph.

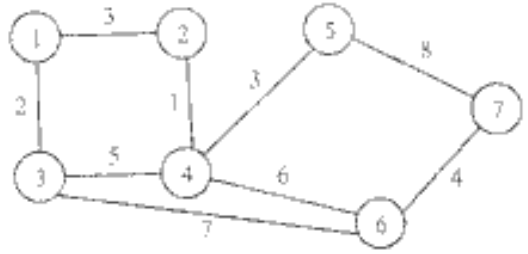

Fig. 1

Unit – IV

4. (a) What is Floyd's algorithm for all pair shortest path ? Find all pair shortest path for the following directed graph.

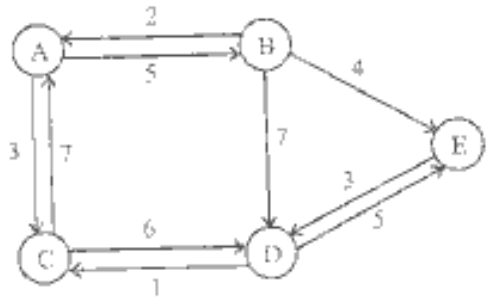

Fig. 2