2008

COMPUTER SCIENCE

(*The Design and Analysis of Algorithm*)

PAPER— CS/MSC/1203

Full Marks : 50

Time : 2 hours

Answer **Q. No. 1** and any **three** from the rest

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. Solve the recurrence by using change variable method :

$$T(n) = 4T\left(\frac{n}{2}\right) + n$$

   where $n \geq 1$ and is a power of 2.   4

2. Write an algorithm to sort a list of numbers by Merge sort technique using Divide-and-conquer approach and estimate its time complexity. $8 + 4$

3. Define graph-coloring problem. Write an algorithm for finding all m-coloring of a graph using backtracking method. Find its time complexity. $1 + 7 + 4$

4. Discuss Strassen's matrix multiplication procedure. Show the Strassen's matrix multiplication process on the following matrix: 12

$$A = \begin{bmatrix} 4 & 2 & 0 & 1 \\ 3 & 1 & 2 & 5 \\ 3 & 2 & 1 & 4 \\ 5 & 2 & 6 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 1 & 3 & 2 \\ 5 & 4 & 2 & 3 \\ 1 & 4 & 0 & 2 \\ 3 & 2 & 4 & 1 \end{bmatrix}.$$

5. Write an algorithm for single source shortest path problem using dynamic programming methodology. Find its time complexity. Find the shortest paths from node 1 to every other node in the following graph. 12

(*Continued*)
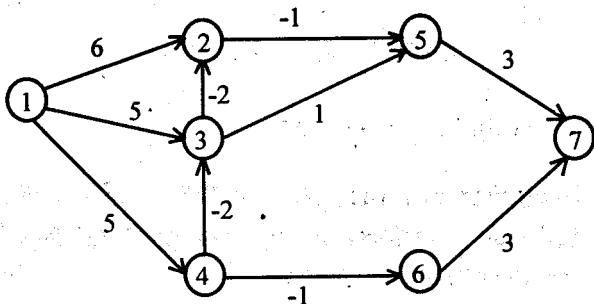
6. Define the minimum cost spanning tree problem. To solve this problem. Write an algorithm by Kruskal's algorithm by greedy approach. Find its total running time. $1 + 7 + 4$

[*Internal Assessment* : 10]

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