M.Sc. 2nd Semester Examination, 2012

COMPUTER SCIENCE

(Design and Analysis of Algorithms)

PAPER—CS-203

Full Marks: 40

Time: 2 hours

Answer Q. No. 1 and any two 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. (a) If $T(n) = 7 \ T(n/2) + 18n^2$, $n \geq 2$ and $T(n) = 1$ if $n = 1$. Find $T(n)$, when $n$ is a power of 2.

(b) What is tail recursion? Give an example of tail recursion.

(c) Define Omega ($\Omega$) notation and $\theta$ notation.

3 + (2 + 1) + 4

(Turn Over)
2. (a) Write the quick sort algorithm and find the best case time complexity of it.

   
   \( (b) \) Write an algorithm to solve traveling salesman problem and show that the time complexity of the algorithm is \( O(n^2) \), where \( n \) represents the number of cities.

3. (a) Write the general algorithm for divide and conquer method. Find its time complexity.

   (b) Write the differences between divide conquer and greedy method.

   (c) Write an algorithm to find the maximum and minimum number from a given set of numbers using divide and conquer method. Find its time complexity.

4. (a) Write an algorithm to solve single source shortest path problem. What is the time complexity of this algorithm?

   (b) Write Prim’s algorithm to find a minimum spanning tree.
5. (a) Explain $n$-queen problem.

(b) Solve the 4-queens problem using backtracking.

(c) Write an algorithm of $n$-queens problem using backtracking.

(d) Define Hamiltonian cycle. What is the Hamiltonian Cycle of the following graph?

\[ 2 + 4 + 6 + 3 \]