Fourth Semester B. Tech. (Computer Science and Engineering / Artificial Intelligence and Machine Learning) Examination

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours]   [Max. Marks : 60

Instructions to Candidates :—
    (1)   Assume suitable data wherever necessary.
    (2)   All questions carry marks as indicated.

1.   (a)   Solve the below recurrence relation using substitution method :

$$T(n) = 2T(n/2) + n \qquad n > 1$$
$$ = 1 \qquad\qquad\quad n = 1 \qquad\qquad\qquad 5(CO1)$$

    (b)   Show that the following equalities are correct :
      (i) $35n^3 + n^2 = \theta(n^3)$,
      (ii) $2n^2 + 3n + 6 = \theta(n^3)$.   5(CO1)

2.   (a)   Find the Maximum sum sub array for the given data sets using divide and conquer method. Explain the complete procedure on given array [13, –3, –25, 20, –3, –16, –23, 18, 20, –7]. Also comment on the complexity of the algorithm.   5(CO2)

    (b)   Multiply the given matrices A and B using Strassen's matrix multiplication algorithm :

$$A = \begin{matrix} 2 & 4 & 5 & 3 \\ 1 & 2 & 2 & 1 \\ 3 & 1 & 1 & 2 \\ 1 & 1 & 1 & 1 \end{matrix}$$

$$B = \begin{matrix} 1 & 1 & 2 & 1 \\ 1 & 1 & 1 & 2 \\ 2 & 2 & 1 & 2 \\ 3 & 1 & 1 & 3 \end{matrix}$$

    5(CO2)

3. (a) Compute the optimal solution for knapsack problem using greedy method $N = 3$, $M = 20$, $(p1, p2, p3) = (25, 24, 15)$, $(w1, w2, w3) = (18, 15, 10)$.

5(CO2)

(b) Explain the general principle of Greedy method and also list the applications of Greedy method. Obtain a set of optimal Huffman codes for the following 6 character given below :

Symbol	Frequency
a	45
b	13
c	12
d	16
e	09
f	05

5(CO2)

4. (a) Find the solution to the travelling salesman problem for the graph whose adjacency matrix is shown below :

Vertex	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

5(CO3)

(b) Using all pairs shortest path algorithm find the length of shortest path from all vertices to all other vertices of the given graph.

	1	2	3	4
1	0	9	−4	∞
2	6	0	∞	2
3	∞	5	0	∞
4	∞	∞	1	0

5(CO3)

5. (a) Give the solution to the 8 Queen's problems using backtracking.   5(CO3)

   (b) Implement sum of subset on the following data using backtracking formulation :
   W = {5, 10, 12, 13, 15, 18}
   M = 30   5(CO3)

6. (a) Compare NP-hard and NP-completeness. How are P and NP problems related ?   6(CO4)

   (b) Devise an algorithm to find clique cover with the help of suitable example.   4(CO4)