Roll No. ....

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TCS–502/TIT–502

B. TECH. (CSE/IT) (FIFTH SEMESTER)
END SEMESTER EXAMINATION, 2019

DESIGN AND ANALYSIS OF ALGORITHMS

Time : Three Hours

Maximum Marks : 100

Note : (i) The question paper contains five questions.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Total marks assigned to each question are **twenty**.

1. Attempt any *two* parts of choice from (a), (b) and (c).   (2×10=20 Marks)

    (a) (i) Find the time complexity of function fun in term of 'n' and 'm' (if n > m).   5

    (ii) What will be the value of 'p' at the end of function fun if n = 16 and m = 8 :   5

    fun(int n, int m)

    {int p=0;

    for (i=0; i<n; i++)

    {for (j=0; j<m; j++)

        {p++;

        m--;

    }

    n--; p++;

    }

    (b) Derive run time complexity for the following recurrence relation using recursive tree method and verify using Master's method :   6, 4

    $$T(n) = 3\, T(n/9) + c \qquad \text{assume } T(1) = c$$

(c) (i) Explain all asymptotic notation with the help of example.   5

     (ii) Solve recurrence relation $T(n) = T(n-2) + T(n-4) + 2$ and assume $T(1) = 2$.   5

2. Attempt any *two* parts of choice from (a), (b) and (c).   (2×10=20 Marks)

   (a) Apply Quick Sort algorithm on the following taking first element as pivot element :   10

$$8\ 4\ 2\ 1\ 3\ 6\ 5\ 7\ 12\ 10\ 11\ 9\ 14\ 15\ 13$$

   (b) (i) Give solution for following fractional-knapsack problem (knapsack size = 10).   5

     (ii) If it is 0–1 knapsack, then what will be the solution ? (Using dynamic program)   5

Item	Cost	Weight
1	40	5
2	20	2
3	30	6
4	30	5

   (c) (i) Design the algorithm for activity selection problem using Greedy method.   5

     (ii) Sort the following sequence in decreasing order using merge sort :   5

$$7\ 9\ 4\ 11\ 21\ 4\ 20\ 6$$

3. Attempt any *two* parts of choice from (a), (b) and (c).   (2×10=20 Marks)

   (a) Apply Matrix Chain Multiplication Order algorithm for the following matrices :   10

     (i) $A1 = 2 * 4$

     (ii) $A2 = 4 * 2$

     (iii) $A3 = 2 * 3$

     (iv) $A4 = 3 * 3$

(b) (i) Explain the Hamiltonian Circuit Problem with the example. (Using Backtracking approach)   5

(ii) Solve Assignment problem for the following input (Using Branch and Bound method) :   5

	J1	J2	J3	J4
P1	9	2	3	6
P2	3	7	4	5
P3	1	2	6	5
P4	1	3	2	9

(c) (i) Write down algorithm for counting sort. Derive its time complexity.   5

(ii) Sort the following numbers using Radix sort :   5

    2478 5932 481 2267 9634 7866 2314 4967 1583

4. Attempt any *two* parts of choice from (a), (b) and (c).   (2×10=20 Marks)

(a) Design the Bellman-Ford algorithm for finding existence of negative weight cycle in given Graph. Derive its time complexity.   6, 4

(b) Write down Prim's algorithm for finding minimum spanning tree and apply this algorithm on the following graph :   10
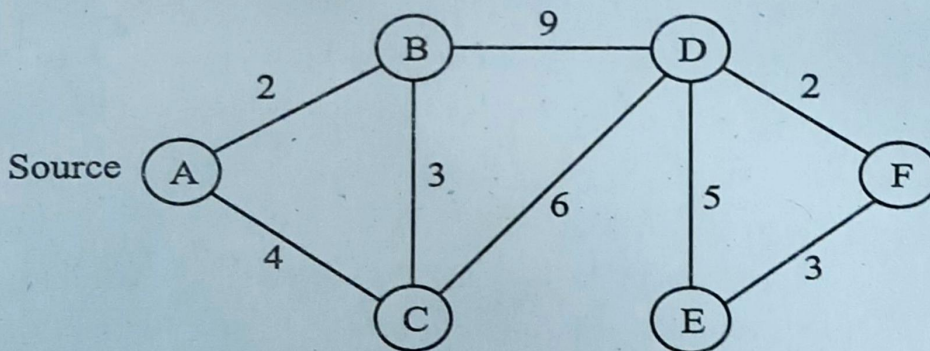
    (c) (i) What are the different Graph Representations ? Explain with the help of example.   5

        (ii) Write down Floyd-Warshall's algorithm for finding all pair shortest path and gives order of time complexity.   5

5. Attempt any *two* parts of choice from (a), (b) and (c).   (2×10=20 Marks)

    (a) What is approximation algorithms ? What is approximation ratio ? Explain Vertex Cover problem with the help of example using approximation algorithm.   2, 2, 6

    (b) What is P, NP, NPC and NP-hard class of problem ? What is reducibility ? Show the relationship among P, NP, NPC and NP-Hard with the help of diagram.   6, 2, 2

    (c) What is set covering problem ? Solve Set Cover problem using greedy approximation algorithm for the following sets :   3, 7

        $S1 = \{11, 12, 15, 26, 29, 10\}$ $S2 = \{26, 27, 10, 11\}$ $S3 = \{11, 12, 13, 14\}$

        $S4 = \{13, 15, 26, 27, 28\}$ $S5 = \{29, 10, 11, 12\}$ $S6 = \{14, 28\}$

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