H

Roll No. .....

TCS/TIT–502

B. TECH. (CSE/IT) (FIFTH SEMESTER) END SEMESTER EXAMINATION, 2018

DESIGN AND ANALYSIS OF ALGORITHMS

Time : Three Hours

Maximum Marks : 100

Note : (i) This 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* questions 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' in both cases when n > m and when n <= m. 5

(ii) What will be the value of p and q at the end of function fun if n = 10 and m = 5 ? 5

```
fun(int m, int n)
```

```
{int p = 0, q = 0;
for (i = 0; i < n; i ++)
for (j = i; j < m; J ++)
if (n > m)
p++;
else
q++; }
```

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

$T(n) = 3T(n/9) + c$ assume $T(1) = c$

(c) (i) Explain all Asymptotic Notation with the help of example. 5

(ii) Solve $T(n) = T(n/2) + 2$ using backward substitution method assume $T(1) = 2$. 5

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

(a) Apply Heap Sort Algorithm for sorting following numbers in decreasing order : 10

9 4 7 6 5 2 11 13 7 3

(b) (i) Give solution for the following fractional-Knapsack problem (Knapsack Size = 7). 5

(ii) If it is 0 – 1 Knapsack then what will be the solution (Using Dynamic Programming) ? 5

Item	Cost	Weight
1	4	2
2	10	4
3	9	3
4	18	6

(c) (i) Solve activity selection problem for following set using Greedy method : 5

Activities	S (*i*)	F (*j*)
a	1	2
b	3	4
c	2	5
d	5	7
e	6	8
f	6	10
g	7	10
h	9	11
i	8	15
j	10	13
k	9	17

(ii) Sort the following sequence in increasing order using insertion sort : 5

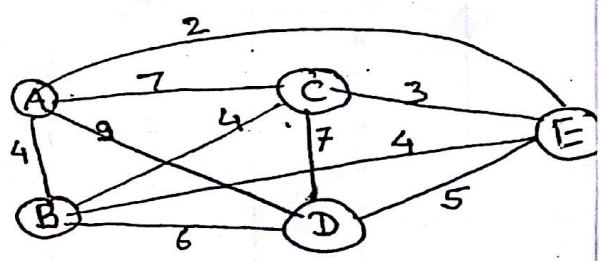
7 9 4 11 21 4 20 6

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

(a) Apply Matrix Chain Multiplication Order algorithm for the following matrices : 10
A 1 = 2 * 3, A 2 = 3 * 1, A 3 = 1 * 5, A 4 = 5 * 4

(b) (i) Explain the subset-sum problem with the help of example. (Using Backtracking approach) 5

(ii) Solve travelling salesman problem for following graph (Branch and Bound method) : 5



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

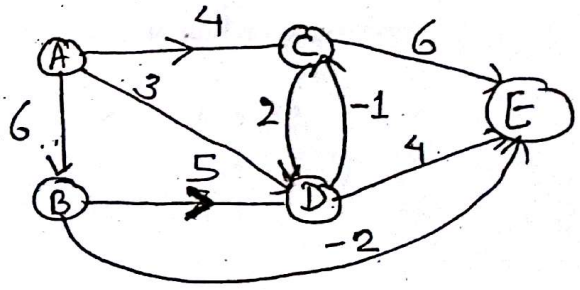
(ii) Sort the following numbers using bucket sort : 5

0.32 0.47 0.21 0.99 0.57 0.22
0.97 0.76 0.56 0.29

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

(a) Write down the Floyd-Warshall's Algorithm for finding All-Pair Shortest Path. Derive its time complexity. 6, 4

(b) Apply Bellman-Ford algorithm on following graph consider 'A' as source node : 10



(c) (i) What are the different data structures used in DFS and BFS ? Explain with the help of example. 5

(ii) Write down algorithm for minimum spanning tree using Kruskal's method and give order of time complexity. 5

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

(a) Write down polynomial time algorithm for Vertex Cover problem using some approximation. What will be the approximation ratio for this algorithm ? 6, 4

(b) What is P, NP class of problem ? Differentiate between NP-complete and NP-hard problem. Show the probable relationship among P, NP, NPC and NP-Hard with help of diagram. 4, 4, 2

(c) What is Set Covering Problem ? Solve set cover problem using Greedy approximation algorithm for following sets : 3, 7

S1 = {1, 2, 5, 6, 9, 10} S2 = {6, 7, 10, 11}

S3 = {1, 2, 3, 4} S4 = {3, 5, 6, 7, 8}

S5 = {9, 10, 11, 12} S6 = {4, 8}