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TCS/TIT–502

B. Tech. (CS & IT) (Fifth Semester)
End Semester EXAMINATION, 2017
DESIGN AND ANALYSIS OF ALGORITHM

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

   (a) What do you understand by algorithms ? Explain the procedure to derive order of growth of recursive and non-recursive algorithms.

   (b) (i) Write any in-place and stable algorithm to sort an array in non-increasing order.

(ii) Analyze the time complexity of the following piece of code :

```
Code( )
{ i = 1, s = 1
While (s < = n)
{
I + + ;
s = s + i;
printf("time complexity");
}}
```

(c) Derive the optimal sequence of multiplying the following array of matrices :

A = (4*5*8*2*3).

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

(a) Write the algorithm of Merge sort and analyze its order of growth.

(b) Sort the following array with heap sort (show all steps) :

8, 9, 3, 5, 4, 1, 7, 10, 15, 13, 18, 11

(c) Write the algorithm of quick sort. Write its recurrence relation equation of all cases.

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

(a) Solve the following assignment problem using branch and bound technique :

	Job 1	Job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

(b) (i) Solve the following subset-sum problem using backtracking :

Set S = {1, 4, 6, 8, 9, 10}

Sum X = 19

(ii) Solve the following 0—1 knapsack problem using dynamic programming :

Capacity M = 12

Item	Value	Weight
1	14	2
2	33	3
3	20	2
4	18	3
5	12	4

(c) Write the algorithm of counting sort and apply on the following array :

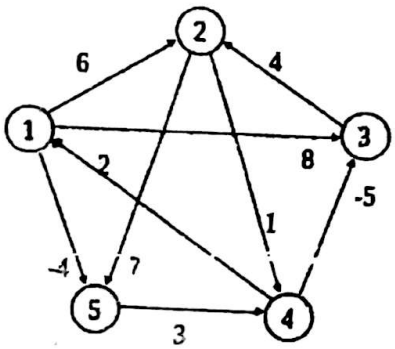
0, 1, 0, 2, 2, 0, 4, 0, 3, 3, 0, 4, 0, 5, 0, 1

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

   (a) What do you understand by the term graph ? Name the representation techniques of graph. Write the algorithm of BFS and DFS.

   (b) Prove the correctness of Bellman-Ford algorithm of negative weighted cycle graph.

   (c) Apply Floyd-Warshall algorithm on the following graph :



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

   (a) Discuss on the terms P, NP, NP-hard and NP-complete class in detail.

   (b) Discuss the tractable and intractable problems with respect to polynomial and non-deterministic polynomial problems.

   (c) Solve the vertex cover and set covering problem for the following graph :