Total No. of printed pages = 8

CS 131604

Roll No. of candidate | | | | | | | | | | |

2017

B. Tech. 6th Semester End-Term Examination

DESIGN AND ANALYSIS OF ALGORITHMS

Full Marks – 100 Pass Marks – 35 Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer any *ten* from the following questions : 10×3=30

(a) Define algorithm. What are its characteristics ?

(b) Define Asymptotic Analysis. Explain with notations.

(c) Write the properties of a tree.

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(d) Find the Asymptotic rate for the following expressions :

(i) $\lg n!$

(ii) $\sum_{i=1}^{n} 1/i$

(iii) $1^K + 2^K + 3^K + \ldots + n^K$

(iv) $1 + 2 + 4 + \ldots + 2^K$

(e) Why recurrence relations is used ? Explain.

(f) Explain how typical algorithm characteristics differ from randomized algorithm ?

(g) What is loop invariant ? How is it checked ?

(h) What are the features of brute force method ? Give example.

(i) Rewrite the following functions in order of magnitude :

2^n, n^{312}, $n \log^n$, $n^{\log n}$, $\log^2 n$

(j) Define NP - complete class. Use diagram.

(k) State the difference between backtracking and Branch and Bound methods.

(l) Give the difference between tree and graph.

(m) Give the difference between old knapsack and fractional knapsack problem.

2. Answer any *five* from the following questions : 5×4=20

(a) What do you mean by Heuristic method ? Explain with example.

(b) Define Tractable and Intractable problems. List the algorithms that fall under these categories with complexities.

(c) Solve the recurrence relation $C_n = C_{n/2} + n$. Where n is a power of 2. The initial condition $C_1 = 0$.

(d) Travelling salesman problem is NP hard. Explain.

(e) Design any brute force sorting algorithm.

(f) Define space complexity. What is the space and time complexity at the following recursive algorithm :

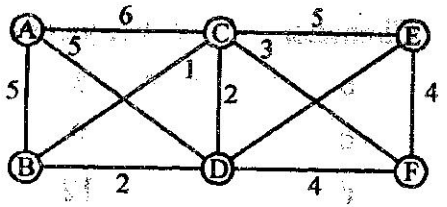
```
A(n)
{
    if (n ≥ 1)
    {
        A (n–1) ;
        print ("%d", n) ;
        A (n–1) ;
    }
}
```

3. Answer any *four* from the following questions : 4×5=20

(a) Consider the following table that consists of workers A, B, C, D with corresponding cost of time by each worker on their ability to finish Job1, Job 2, Job 3, Job 4 respectively. Solve the job assignment problem using Branch and Bound :

	Job1	Job2	Job3	Job4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

(b) Find the minimum spanning tree of the following graph using a greedy approach :



(c) Consider the following table that consists of some items with weight and cost values. If knapsack capacity is 60 kg, find the feasible solution using fractional knapsack

Items	Weight	Value
I_1	5	30
I_2	10	40
I_3	15	45
I_4	22	77
I_5	25	90

(d) Complete Huffman coding for the set at symbols shown in the following table along with the frequency :

Character	Frequency
a	5
b	9
c	12
d	13
e	16
f	45

(e) Explain about 4 queen problem with an example.

(f) Write an algorithm for topological sorting.

(g) Explain the difference between dynamic programming and divide and conquer algorithm.

4. Answer any *three* from the following questions : 3×10=30

(a) Use master's theorem to find complexity of the following recurrence relations :

(i) $T(n) = 4T(n/2) + n^2$

(ii) $T(n) = 2^n T(n/2) + n^n$

(iii) $T(n) = 64\,T(n/8) + n^2 \log n$

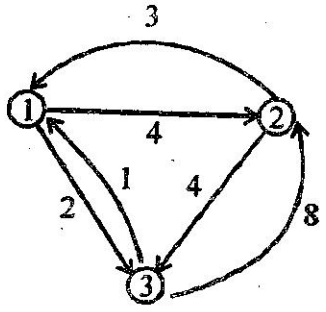
(iv) $T(n) = 0.5\,T(n/2) + 1/n$

(v) $T(n) = \sqrt{2}\,T(n/2) + \log n$.

(b) Find the longest common subsequence between the two patterns "MYCYZ" and "YDCMYZ" and solve it using backtracking method.

(c) Explain about the various approximation Algorithms.

(d) Solve the following TSP using Branch and Bound technique :



(e) Consider the graph shown below and find the shortest path using the Floyd-Warshall algorithm.