



6th Semester (Back-2008 AB & Prev.)  
D&AA CS-602  
(CSE)

## SPRING END SEMESTER EXAMINATION-2014

6<sup>th</sup> Semester B.Tech

### DESIGN & ANALYSIS OF ALGORITHMS CS-602

(Back-2008 Admitted Batch & Previous)

Full Marks: 60

Time: 3 Hours

Answer any SIX questions including Question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. a) Find out the complexity of the following segment of C code for  $[2 \times 10]$   
any  $n > 0$ .

```
int fun(int n)
{
    if n=1
        return 1;
    else
        return fun((n-1)+n);
}
```

- b) Match the following:

- |                         |                          |
|-------------------------|--------------------------|
| (i) Dynamic programming | (i) NPC                  |
| (ii) Divide and conquer | (ii) 0-1 knapsack        |
| (iii) Greedy approach   | (iii) Quick sort         |
| (iv) Hamiltonian cycle  | (iv) fractional knapsack |

- c) Arrange the following in decreasing order of growth  
 $2^{\log n}$ ,  $4^{\log \log n}$ ,  $n^2 \log n$ ,  $\log \log n$ ,  $n \log n$ ,  $n \log n$

(1)

- d) Given 10 files, of lengths  $l_i = \langle 100, 400, 300, 20, 130, 50, 70, 120, 630, 210 \rangle$  and 2 tapes  $t_i = \langle t_1, t_2 \rangle$  find the optimal way of storage in each tape where minimum access time will be spent for each file.
- e) Write four applications of minimum cost spanning tree.
- f) Given is the following set of activities, find out what are the activities which can be performed in a sequence on a single stage.

No.	1	2	3	4	5	6	7	8	9	10
S[]	0	5	1	3	3	5	12	8	2	8
F[]	4	7	5	5	8	9	14	12	13	11

- g) Compare Greedy approach with Dynamic approach.
- h) Find out places of 5 queens in  $5 \times 5$  chess board such that no 2 queens can attack each other.
- i) Write down two major differences between Breadth-first search and Depth-first search.
- j) What are the advantage and disadvantages of using adjacency list structure and adjacency matrix structure in representing graphs?
2. a) Write the insertion sort procedure and find its best case and average case time complexity. [4]
- b) Construct the max heap structure taking the following elements [4]  
5, 15, 25, 16, 32, 50, 150, 23
3. a) Find an optimal code for each character contained in a file. [4]  
The frequencies of each character in the file are: - a: 15, b: 25, c: 5, d: 35, e: 20

- b) Given the following jobs with their profit and deadlines. Find what are the jobs can be completed by time or before time to get maximum benefit. Assume that each job can be performed by unit time. [4]

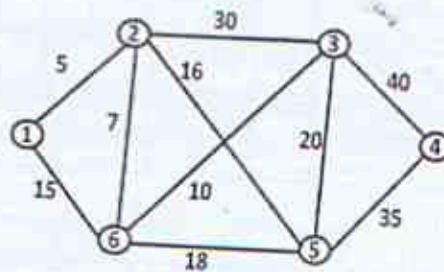
Job no.	1	2	3	4	5	6	7
Profit	18	20	1	30	3	5	6
Dead line	3	5	2	2	4	2	1

4. a) Explain how knapsack problem is solved using Dynamic Programming approach? Consider items  $n=5$ , Weights  $(w_1, w_2, w_3, w_4, w_5)=(2,3,4,6,8)$ , Profit  $(v_1, v_2, v_3, v_4, v_5)=(1,3,5,8,10)$  and Knapsack capacity  $W=8$ . Find optimal solution to fill the knapsack. [4]
- b) Find the longest common sub sequence for the following sequence. [4]

$X=<A,B,C,B,D,A,B>$  and  $Y=<B,D,C,A,B,A>$

5. a) Explain all the asymptotic notations with example. [4]
- b) Write the algorithm and find the time complexity for the procedures BUILD\_MAX\_HEAP(), HEAP-SORT(). [4]
6. a) Use master method to give tight asymptotic bounds for the following recurrences. [4]
- (i)  $T(n)=9T(n/3)+n$
- (ii)  $T(n)=T(2n/3)+1$
- b) Write the procedure of placing  $n$ -queens in  $n \times n$  chess board. [4]

7. a) Write the recursive procedure of max min problem and explain with example how it will work for a set of input numbers. [4]  
b) Apply the Prim's method of finding minimum cost spanning tree on the following graph. [4]



8. Write short notes on any two.

- a) Divide and conquer method  
b) Classes of problems.  
c) Dynamic approach

[4 × 2]

X X X X X