

GANPAT UNIVERSITY

B. Tech. Semester VI (Computer Engineering / Information Technology)

Regular Examination May 2014

2CE604 / 2IT604 : Design and Analysis of Algorithms

Time: 3 Hours

Total Marks: 70

- Instruction:** 1. Each section should be written in a separate answer book.
2. Be precise and to the point in your answer.

Section - I

Q - 1 (a) Find the space complexity for the following function:

4

// note: x is an unsorted array

```
int findMin(int[] x) {
    int k = 0; int n = x.length;
    for (int i = 1; i < n; i++)
        if (x[i] < x[k])
            k = i;
    return k; }
```

(b) Explain the following terms with example:

4

1. Tight bound
2. Loose bound

(c) Prove that following statements are true or false:

4

1. $f(n) = 10n^2 + 7 \neq \Omega(n^3)$
2. $f(n) = 7n \cdot 2^n + 22 = O(n^2 2^n)$

OR

Q - 1 (a) Using the step count method analyze the time complexity when two $m \times n$ matrices are added.

4

(b) Explain the following terms with graph:

4

1. Big-O notation
2. Omega notation

(c) Express the complexity of following functions using theta (Θ) notation. Clearly indicates value of constants C_1 , C_2 and n_0 .

4

3. $f(n) = 17 \cdot 2^n + 5n^3 + n^2 + 6$
4. $f(n) = 79n^3 + 44n$

OR

Q - 2 (a) Solve the recurrence: $T(n) = 2T(n-1) + 3^n + n \cdot 2^n + 2^n$

6

(b) Solve the recurrence using change of variable method:

5

$$T(n) = \begin{cases} 1 & , \text{if } n = 1 \\ 3T(n/2) + n & , \text{if } n \text{ is power of 2, } n > 1 \end{cases}$$

Q - 2 (a) Solve the following homogeneous recursion:

6

$$T(n) = \begin{cases} n & , \text{if } n = 0, 1 \text{ or } 2 \\ 5T(n-1) - 8T(n-2) + 4T(n-3), & \text{otherwise} \end{cases}$$

(b) Solve the recurrence using intelligent guesswork method with initial cond. $T(0) = 0$,

5

$$T(n) = 2T(n/3) + n$$

Q - 3 (a) Solve the recurrence: $T(n) = 9T(n/3) + n$

4

(b) Solve the recurrence: $T(n) = 2T(n/2) + n^2$

4

(c) Which function grows faster? Justify your answer.
 $n^{\lg n}$ vs $(\lg n)^n$

2

(d) What is an algorithm? Which factors are affecting on algorithm analysis?

2

Section - II

- Q – 4 (a) Sort following data by using Insertion Sort: E,X,A,M,P,L,E 3
- (b) Apply “Counting Inversion Algorithm (Divide and Conquer)” on following data 5
and find no’s of Inversion.
89,23,74,56,99,21,13,74
- (c) Give solution of 8-Queens Problem using Backtracking Method. 4

OR

- Q – 4 (a) Sort following data by using Bubble Sort: 12,89,36,0,8,10,2,45,99,23 3
- (b) Explain the use of Divide and Conquer Technique for Binary Search Method. Give the algorithm for Binary Search Method. What is time complexity of Binary Search Method? 5
- (c) Write algorithm of Selection Sort and Find its best case time complexity. 4

- Q – 5 (a) Define Minimal Spanning Tree (MST). Explain Krushkal’s Algorithm to find MST with an example. 5
- (b) Given coins of denominations 2, 4 and 5 with amount to be pay is 7. Find optimal no. of coins and sequence of coins used to pay given amount using Dynamic Programming method. 3
- (c) Explain in brief Breadth First Search with Example. 3

OR

- Q – 5 (a) Explain characteristics of Greedy Algorithm. Also Explain data structure and functions use by greedy method by using Making Change example. 5
- (b) Solve following knapsack problem using dynamic programming algorithm with given capacity $W=5$, Weight and Value are as follows : 4
(2,12),(1,10),(3,20),(2,15).
- (c) Write down difference between Kruskal’s and Prim’s algorithm for MST. 2

- Q – 6 (a) Explain use of Branch & Bound Technique for solving Assignment Problem. 5
- (b) Consider the chain of matrices A1, A2, ..., A6 with the dimensions given below. 5
Give the optimal parenthesization of a matrix chain product:
Matrix Dimension
A1: 30 X 35
A2: 35 X 15
A3: 15 X 5
A4: 5 X 10
A5: 10 X 20
A6: 20 X 25
- (c) Give Difference between Dynamic Programming and Greedy Method. 2

END OF PAPER