DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY LONERE – RAIGAD -402 103

Semester Examination – Summer - 2019

Branch: Computer Engineering **Sem.:- IV**

Subject and Subject Code:- Design and Analysis of Algorithms (BTCOC401)

Date:- 14/05/2019 **Marks: 60** **Time:- 3 Hrs.**

Instructions to the Students

1. Each Question carries 12 marks.
2. Attempt **Any Five** Questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q.1. Attempt Any Three from the following questions. **(04*03=12)**

a) Define Big *O* notation? What is total time complexity of following code ?

```
int a,b,c,d,i.
{
        for (i = 0 ;i<=11; i++)
                {
                 a  = a+b;
                }
        d= c+a;
}
```

b) Define algorithm. What is the need of algorithm analysis ? Which factors affect runtime of algorithm?

c) Solve the following recurrence relation using characteristic polynomial.

$$t_n = \begin{cases} n & \text{if } n=0 \text{ or } n=1 \\ t_{n-1} + t_{n-2}, & \text{otherwise} \end{cases}$$

d) Solve the following recurrence using master method. Verify solution using substitution method.

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

Q.2.Attempt the following questions **(06*02=12)**

a) Write an algorithm of merge sort and illustrate the operation on an array using Merge Sort.

A={5 2 4 7 1 3 2 6}

b)Multiply following two matrices using Strassen's matrix multiplication algorithm.

$$\text{Matrix A} = \begin{Bmatrix} 1 & 2 \\ 3 & 4 \end{Bmatrix} \quad \text{Matrix B} = \begin{Bmatrix} 5 & 6 \\ 7 & 8 \end{Bmatrix}$$

Matrix A = {1 2 3 4} Matrix B= {5 6 7 8}

Q.3. Solve the following questions **(06*02=12)**

a) What is Greedy method? Explain elements of Greedy method.

b) Construct an optimal instance of Huffman Code for the following set of frequencies using Greedy method.

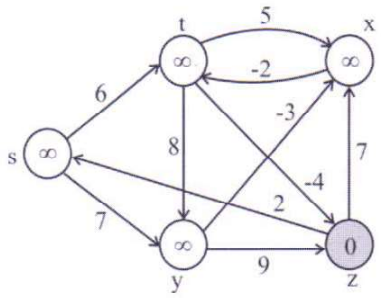
Characters	A1 "a"	A2 "b"	A3 "c"	A4 "d"	A5 "e"	A6 "f"
Frequency	45	13	12	16	9	5

Q.4. Solve the following questions: **(06*02=12)**

a) Determine longest common subsequence using dynamic programming approach for X and Y. What is the length of longest common subsequence?

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

b) Find the shortest path using Bellman Ford algorithm for the following graph. Note that vertex z is source vertex.



Q.5. Solve the following questions **(06*02=12)**

a) Solve the following 15-Puzzle Problem.

1	2	3	4
5	6		8
9	10	7	11
13	14	15	12

b) How 4- Queens problem is solved by backtracking approach? Explain with the help of state space tree.

Q.6. Attempt any three Questions: **(04*03=12)**

a) Explain Class P, Class NP and Class NPC problems in detail.

b) Insert the following keys into empty B-Tree with minimum degree 2. Show the configuration of B-Tree after each insertion operation.
Keys: F S Q K C L H T V W M R N P A B X Y D Z E

c) What do you mean by Red Black Tree?. What are the characteristics of Red Black tree?

d) Explain Polynomial time reduction with example.

****