IIIT Vadodara
CS203: End Remote Exam
Total Marks: 25

January 5, 2022

1 Problem

Given below two recurrence relation with bound
(a)$T(n) = 2T(n/2) + n^2 logn$ (Guess:- $nlogn$)
(b)$T(n) = T(n-1) + n^2$ (Guess:-$nlogn$)

1. Prove the upper bound given for each recurrence relation is not true.
   You can only apply the **substitution method** (Substitution method: Make a guess then prove that your guess is correct).
   (You will not get marks, if you follow iterative substitution, Master method or Recursion Tree) **(Marks: 2+2=4)**
2. Make a right guess for the above recurrence relation and prove it by the **substitution method** that your guess is correct.
   (I will not check your answer if you use any other method for giving the bound) **(Marks: 2+2=4)**

2 Problem

You have to send your "full name(First, Middle (if any) and Last Name)" in encrypted form. (Those who have more than 3 words in his/her name, can take any three words, but write which word you are picking).

Following steps need to be followed for finding two random numbers:
1. Take your roll number,
2. Find the sum of the digit of your roll-number (S)
3. Compute R=S % 5. If the remainder is zero, then take R as 3, Otherwise, take whatever will be the remainder(R).
4. From R, Generate $T = R + 4$.
5. Thus you have two random Numbers R and T.
6. Add this R and T alternatively in number of frequency of character of your name.

For Example: If 202051208 S=20, R=S%5=0, then R is 3 and T is 7.
If 202051207, S=19, R=S%5=4, then R is 4 and T is 8.
Name :- Aman Roll-No (202051207)
Count the number of frequency of each character and show the table as

I	II	III
Character	Frequency of Character	After adding value "R" or "T" in column "II"
A	2	6
M	1	9
N	1	5

Show the Huffman tree and the number of bits for each character when you use the variable encoding technique. **(Marks:- 2+3+4=9)**

3 Problem

Write the recursive structure of the Floyd Warshall Algorithm and its complexity.
Apply Floyd Warshall Algorithm to find shortest distances between every pair of vertices in a given edge-weighted directed Graph. .
Show all the matrices {D[0], D[1], ...} for getting the final solution. **(Marks: 3+5=8)**