Home Assignment-1 (CS204)

Please solve all the problems given below. Contact Prashant <prashant.pcs17@iitp.ac.in>; and Deeksha <1821cs13@iitp.ac.in> for any difficulties. Question 1<f> and 1<g> and 3 will be evaluated while other questions are practice problems. You have to solve it and submit it by 20th August (to Prashant/Deeksha) in an A4 sheet. Please write your name and roll number and sign in the A4 sheet.

1. Solve the following recurrence relations. Show the steps :
   a. $T(n) = 2T(n-1) + T(n-2) + c$, $T(0)=T(1)=1$
   b. $T(n) = 4T(n/2) + cn$
   c. $T(n) = \sqrt{(2)}\, T(n/2) + \sqrt{n}$, $T(1) = 1$
   d. $T(2^k) = 3\, T(2^{k-1}) + 1$, $T(1) = 1$
   e. $T(n) = 2T\left(\lfloor n/2 \rfloor\right) + \sqrt{n}$, $T(1) = 1$, for $n \geq 2$
   f. $T(n) = T(n/4) + T(n/2) + cn^2$, $T(1) = c$, $T(0) = 0$ [2]
   g. $T(n) = T(n/3) + T(n/9) + n$ [2]

2. Suppose there are 'n' elements (n>1). Write pseudo code to print all possible combination of these elements.
   Example: **n = 3**
   Input:{1,2,3}
   Output:{(1,2,3)(1,3,2)(2,1,3)(2,3,1)(3,1,2)(3,2,1)}

3. Write a recursive Function to reverse any string. [3]
   Input: "I am going"
   Output: "going am I".

4. The super digit(z) of an integer 'a' can be defined as follows.
   (i) If 'a' has only one digit then 'z' = 1
   (ii)Otherwise the super digit(z) is defined as super digit of digit Sum of **z.**
   You are given 3 numbers. **p,q,r.** Calculate the super digit of "X" where X is
   Product of **p,q,r** where **(1<(**p,q,r)<10^100).Write a pseudo code to solve this problem.

Case 1

Input: 1(p),2(q), 3(r)

X = pqr = 6

Output(X) = 6

Case 2:

Input: p = 287,q = 725, r = 13

X = pqr = 2704975

Output(z)

= superdigit(2+7+0+4+9+7+5)

= superdigit(34)

= superdigit(3+4)

= superdigit(7)

= **7**