ASSIGNMENT-1

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SUB : DESIGN AND ANALYSIS OF ALGORITHM

Sub code : CSA 0688

Solve

a.) $x(n) = x(n-1)+5$ for $n>1$ $x(1)=0$

b.) $x(n) = 3x(n-1)$ for $n>1$ $x(1)=4$

$x(n) = x(n-1)+6 \rightarrow ①$

sub $x(n-1)$ in ①

$x(n) = (x(n-2)+1)+5$

$= x(n-2)+6 \rightarrow ②$

sub $x(n-2)$ in ②

$x(n) = (x(n-3)+1)+6$

$= x(n-3)+7 \rightarrow ③$

$x(k) = x(n-k)+(n+4)$

$n-k=0$

$n=k$

$= x(n-n)+(n+4)$

$= x(0)+n+4$

$= 1+n+4$

$= 5$

$\Rightarrow O(n) \rightarrow$ Linear

$x(n) = x(n-1)+1$

$x(n-1) = x(n-1-1)+1$

$x(n-2)+1$

$x(n-2) = x(n-2-1)+1$

$= x(n-3)+1$

5) $x(n) = 3x(n-1)$ for $n>1$ $x(1)=4$

$x(n) = 3x(n-1)$ — ①

sub $x(n-1)$ in ①

$x(n) = 3\ (3x(n-2))$

$= 9x(n-2)$ — ②

$x(n) = 9.3\ x(n-3)$

$= 27\ x(n-3) \rightarrow$ ③

$x(k) = k.3\ x(n-k)$

$n-k=0$

$n=k$

$= n\ 3x(n-n)$

$= n.30$

$= O(n) \rightarrow$ Linear

$x(n) = 3x(n-1)$

$x(n-1) = 3x(n-1-1)$

$= 3x(n-2)$

$x(n-2) = 3x\ (n-2-1)$

$= 3x(n-3)$

3.

2\. a) $T(n) = T(n/2)+1$

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

a) $T(n) = T(n/2)+1 \rightarrow n=2^k$

$T(n) = T(n/2)+1$

$T(n) = (T(n/4)+1)+1$

$= T(n/4)+2$

$T(n) = T(n/8)+1+2$

$= T(n/8)+3$

⋮

k Times

$T(n) = T(n/2^k)+k$

$n/2^k = 1$

$2^k = n$

$k = \log_2 n$

$T(n) = \log_2 n+1$

3. Analyze The order of growth

$F(n) = 2n^2 + 5 \quad g(n) = 7n$

$F(n) = 2n^2 + 5$

$g(n) = 7n$

$= (2+5)\ n^2$

$= 7n^2$

$c = 7 \quad g(n) = 7n$

$f(n) \geq g(n)$

$\Rightarrow F(n) = 2g(n)$

Hence proved.

4 Tower of Hanoi:

Tours of Hanoi (n, source, destination, aux)

if n==1

move desk from destination.

else

Tours of Hani (n-1, source, destination, aux)

move dis from source to destination

Toure of Hanai (n-1, aux, dstination, source)

$\Rightarrow T(n) = 2T(n-1)+1$

$T(n-1) = 2i(n-2)+1$

$T(n) = 2(2i(n-2+)1)+1$

$= 4T(n-2)+3$

$T(n) = 2^2 T(n-2) - (2^2-1)$

$T(n) = O(2^n)$

$= 2^n - 1$

5) a) $T(n) = 3T(n/2) + n^2$

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

using Master theorem

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

$a = 3, \quad b = 2$

$y(n) = n^2$

$\Rightarrow n \log_2^3$

$f(n) \geq n \log_2^3$

$= o(n^2)$ //

b) Master theorem can't be appeal.

$T(n) = T(n/2) / 2^n$.