Tutorial 2

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DAA- Tutorial - 2

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Ans 1. $j=1$ $\quad i=1$

$j=2$ $\quad i=1+2=3$

$j=3$ $\quad i=3+3=1+2+3$

$\vdots$

$j=k$ $\quad i=1+2+3+\dots+k$

as $i<n$

sum of k concecutive integers $= \frac{k(k+1)}{2}$

$\therefore \frac{k(k+1)}{2} < n$

$\frac{k^2+k}{2} < n$

$\Rightarrow$ After removing Constants

$k^2 < n \Rightarrow k < \sqrt{n}$

$\therefore T(n) = O(\sqrt{n})$ Ans

Ans 4 $\quad T(n) = 2T(n/2) + cn^2$

Using Master's Method $\Rightarrow T(n) = aT(n/b) + f(n)$

$a \geq 1, \; b > 1, \; c = \log_b a$

$c = \log_2 2 = 1$

$f(n) > n^c$

$T(n) = (f(n))$

$\Rightarrow O(n^2)$ Ans

Ans 5 $\quad i \quad\quad j$

Ans 5

i	j
1	1, 2, 3, ... n times
2	1, 2, 3, ... n/2 times
3	1, 2, 3, ... n/3 times
⋮	⋮
n	1 time

$$T(n) = n + n/2 + n/3 + n/4 + \dots + 1$$
$$= n(1 + 1/2 + 1/3 + 1/4 + \dots 1/n)$$
$$T(n) = n(\log n)$$ Ans

Ans 6 $T(n) = 2, 2^{k}, 2^{k^2}, 2^{k^4}, \dots, 2^{k \log k(\log n)}$

as we know $2^{k \log k(\log n)} = 2^{\log n} = n$

$\therefore$ Total iteration $= \log k(\log(n))$

$$T(n) = O(\log k(\log(n)))$$ Ans

Ans 8 a) $100 < \log(\log n) < \log(n) < \log^2 n <$ root(n) $< n <$
$n \log n < n^2 < 2^n < 4^n < 2^{2^n} < \log(n!) < n!$

b) $1 < \log(\log(n)) < \sqrt{\log n} < \log n < \log 2n <$
$2\log n < n < 2n < 4n < n \log n < n^2 < \log(n!) <$
$n! < 2(2^n)$

c) $96 < \log_8(n) < \log_2(n) < 5n < n\log_6 n$
$< n\log_2 n < n! < \log n! < 8^{2n}$

Ans 2 Recurrence relation of fibonacci series

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

2^0 $T(n)$

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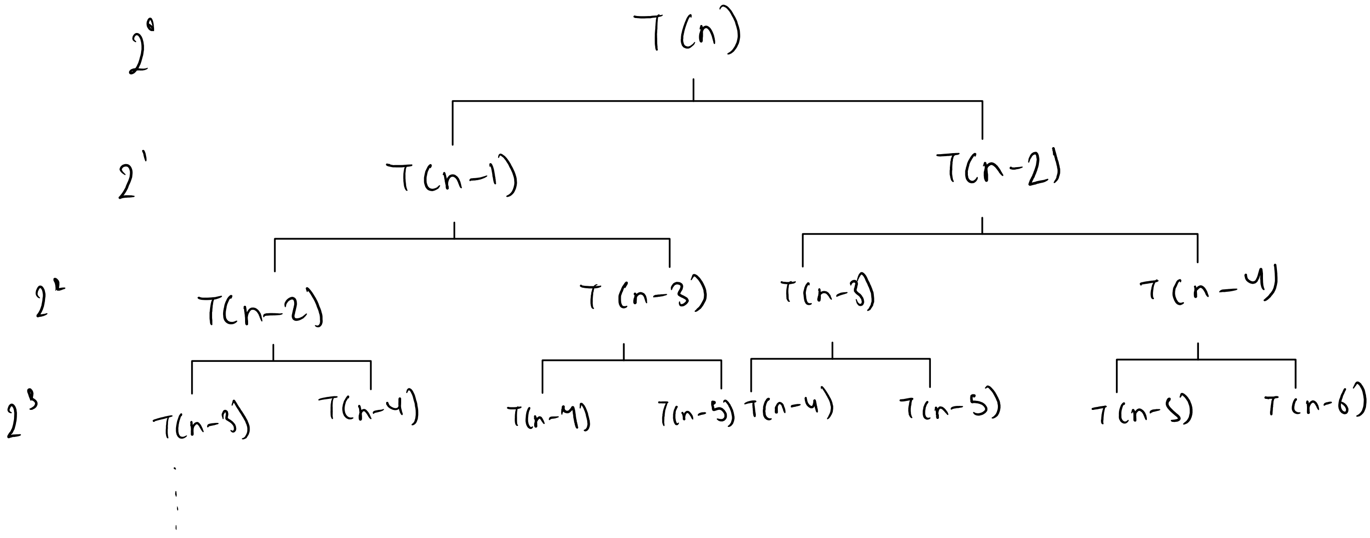

$$T(n) = 2^0 + 2^1 + 2^2 + 2^3 + \dots + 2^n$$

now sum of GP $= \dfrac{a(r^n - 1)}{r-1}$

$a = 1 \quad r = 2 \quad \Rightarrow \dfrac{1(2^n - 1)}{1} \Rightarrow 2^n - 1$

$T(n) = O(2^n)$ <u>Ans</u>

Space complexity depends on the depth of the tree

$\therefore$ Space complexity $= O(n)$ <u>Ans</u>