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Section → DS

DAA Tutorial - 2

Q11) Seriese ⇒ 0, 1, 3, 6, 10, 15 ....

at last iteration x

$$n = 0 + 1 + 2 + 3 + 4 + 5 \ldots + k$$

$$n = \frac{k(k+1)}{2} \Rightarrow n = \frac{k^2+1}{2}$$

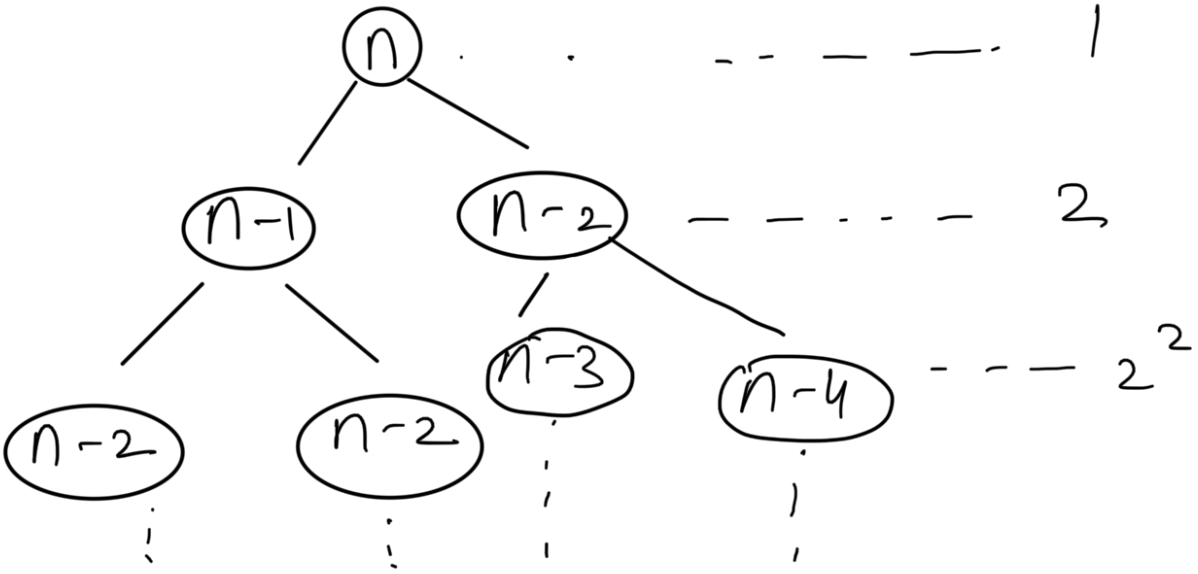
$$n = \frac{k^2+1}{2} \Rightarrow n \cong k^2$$

$$\Rightarrow k \cong \sqrt{n} \Rightarrow TC = O(\sqrt{n})$$

Q12) Recurrance Relation for

fibonacci ↴

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



$TC = 1 + 2 + 4 + \cdots + 2^n = 1\frac{(2^{n+1} - 2)}{2-1}$

$= 2^{n+1} - 2$ so $TC = O(2^n)$

SC → is proportional to height of recurrence tree. ⇒ $O(n)$

Q13) (i) n log n

```
for (i to n)
{
    for (j=1, j<=n ; j*=2)
        O(1) statements
}
```

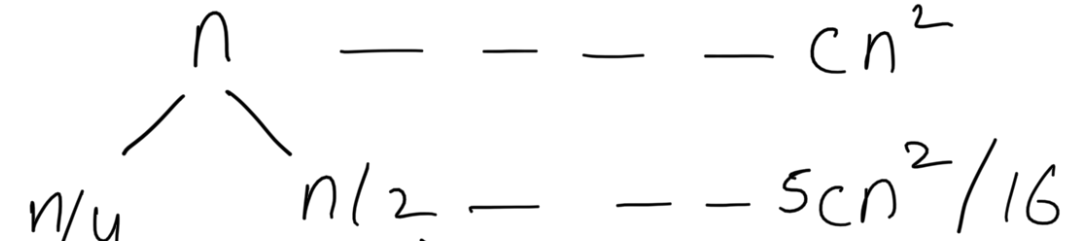
(ii) n^3 →

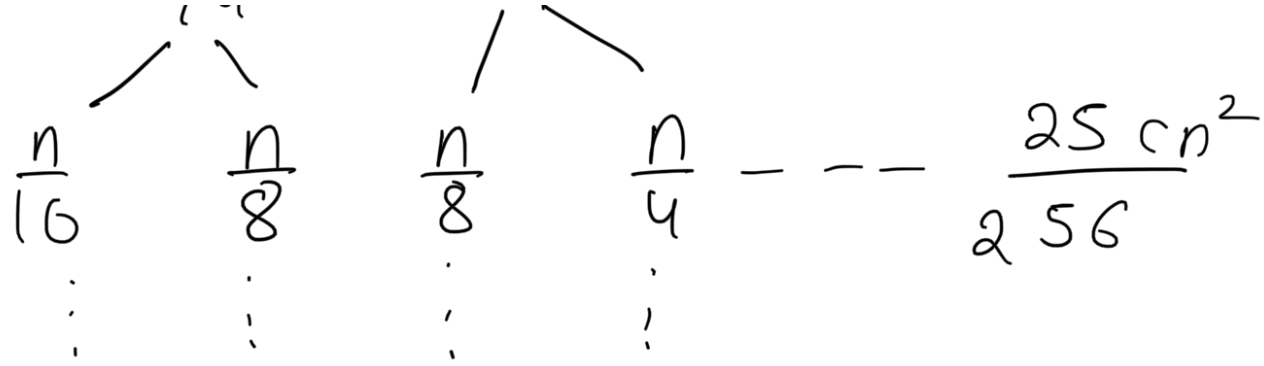
```
for (i to n)
    for (j to n)
        for (k to n)
            O(1) statements)
```

(iii) log(log n) →

```
i=n
while (i>0)
{ =
    i = √i ;
}
```

Q(4) $T(n) = T(n/4) + T(n/2) + cn^2$





$$T(n) = c(n^2 + \frac{5n^2}{16} + \frac{25n^2}{256} + \dots)$$

$$r = \frac{5}{16}, \quad S_n = \frac{1}{1-r} \Rightarrow T(n) = cn^2\left(1 + \frac{5}{16}\dots\right)$$

$$\Rightarrow c(n^2)\left(\frac{16}{11}\right) \Rightarrow T.C = \Theta(n^2)$$

Q15)

i	j	times
1	$1 \to n$	$n-1$
2	$1 \to n$	$(n-1)/2$
3	$1 \to n$	$(n-1)/3$
⋮	⋮	⋮
n	$1 \to n$	$\frac{n-1/n}{n \log n}$

$$TC = O(n \log n)$$

Q16) $i = 2, 2^k, 2^{k^2} \ldots 2^{k^x}$

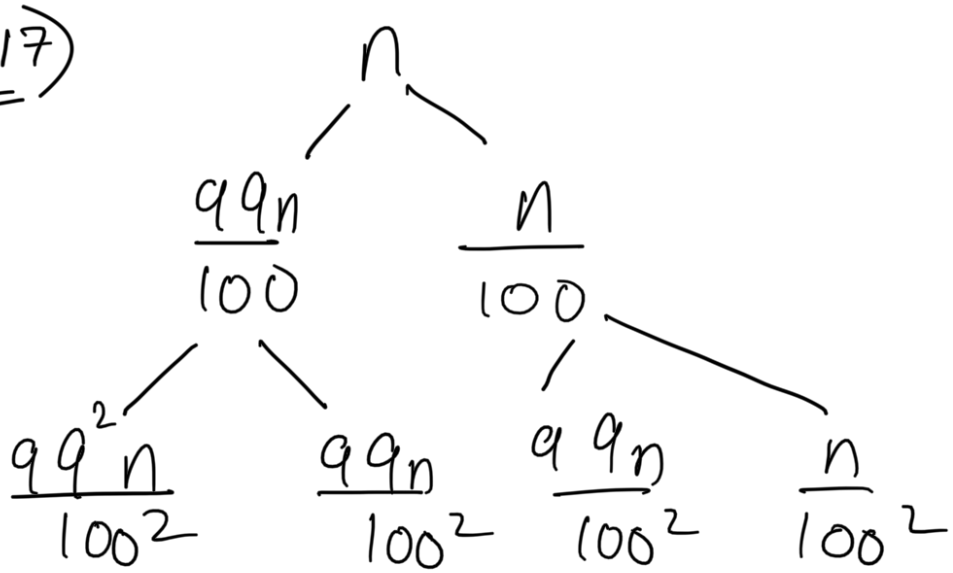
$n = 2^{k^x}$

$\log n = k^x \log 2$

$\frac{\log \log n}{\log 2} = x \log k$

$x = \frac{\log \log n}{\log 2 \log k} \Rightarrow TC = O(\log \log n)$

Q17)



$TC \Rightarrow \log_{\frac{100}{99}} n \cong \log n$

$n = \left(\frac{99}{100}\right)^k \Rightarrow k = \log_{\frac{100}{99}} n$

$T(n) = n\left(\frac{\log \frac{100}{99}}{100}\right)^n = O(n \log_{99} n)$

Q18) (Inc growth)

(a) $100 < \log\log n < \log n < \sqrt{n} < n$

$< n \log n < n^2 < 2^n < 2^{2n} < 4^n < n!$

(b) $1 < \log\log n < \sqrt{\log(n)} < \log n <$

$\log 2n < 2 \log n < n < 2n < 4n < n^2 \log n$

$< \log(n) < 2^{2n} < n!$

(c.) $36 < \log_8 n < \log_2 n < 5n < n \log_8(n)$

$< n \log_2 n < 8n^2 < 7n^3 < \log n! <$

$8^{2n} < n!$