2.)

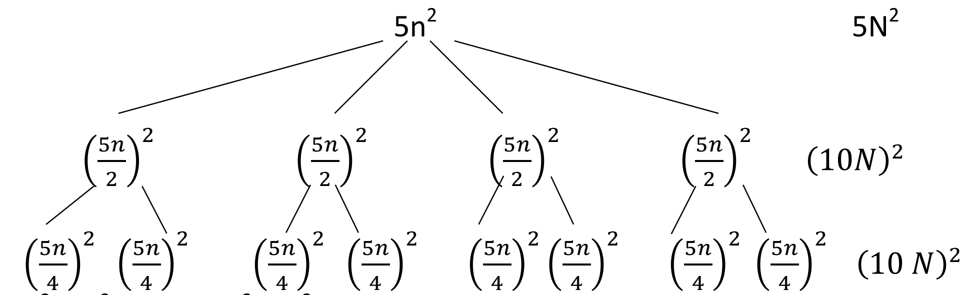
A.) $T(n) = 4T\left(\frac{n}{2}\right) + 5n^2$

i) a) 4

b) n/2

c) $5n^2$

ii)



$5n^2+5n^2+\ldots\ldots..+5n^2=5n^2(1+1+\ldots\ldots+1)$

logn

$T(n) = \theta(n^2 \log n)$

iii) $T(n) = 4T\left(\frac{n}{2}\right) + 5n^2$

a=4 b=2 $f(n)=5n^2$

$\log_2 4=2 = n^2$

Case 2 test:

$F(n)=\theta(n^2\log^k n)\ k \geq 0$

$F(n)= \theta(n^2)$ when k=0

Case 2 satisfies:

$T(n) = \theta(n^2 \log n)$

B.)

$a.) T_1(n) = 15T_1\left(\frac{n}{2}\right) + n^2, n > 1$

A=15 B=2 $f(n)=n^2$

$n\hat{}(\log_b a) = n\hat{}(\log_2 15) = n^{3.91}$

Case 1:

$F(n)= O(n^{3.91-E})$ when E=1.91

Case 1 satisfies so,

$F(n)=\Theta(n^{3.91})$

b.) $T_2(n) = 80T_2\left(\frac{n}{3}\right) + 20n^3, n > 1$

A=80 B=3 $f(n)=n^3$

$n\hat{}(\log_b a) = n\hat{}(\log_3 80) = n^{3.99}$

Case 1:

$F(n)= O(n^{3.99-E})$ when E=.99

Case 1 satisfies so,

$F(n)=\Theta(n^{3.99})$

c.) If we compare the running times of T_1 [$\Theta(n^{3.91})$]and T_2 [$\Theta(n^{3.99})$], T_1 is a little more efficient.