

Q.7. We know FFT breaks the array in two parts and ~~then~~ then calculate FFT. This is repeated till one element

$$\Rightarrow \text{FFT}(N) = \text{FFT}(N/2) + \lambda \text{FFT}(N/2)$$

when  $\lambda = \text{some factor}$

\* Count no. of steps in it, additions =  $N/2$

multiplications =  $N/2$

FFT ~~is~~ =  $N/2$  two times.

$$\Rightarrow \text{Total steps} = 2 \times \frac{N}{2} + 2T(N/2)$$

$$T(N) = N + 2 \left( 2T\left(\frac{N}{4}\right) + N \right)$$

$$T(N) = 3N + 4 \left( 2T\left(\frac{N}{8}\right) + N \right)$$

So we get  $\log_2(N)$  such levels with  $O(N)$  operation at each step.

$$\Rightarrow \text{Complexity of FFT} = O(\log_2(N))$$

Ref: The Computational Complexity of FFT  
by Matthias Lohmeier

Website (folk.uio.no)