Q1 Find fourier transform of $\delta(n-a[0]) + \delta[n+a[0]]$

Sol^n $\rightarrow$ $2\cos(a[0]\,n)$

Q2

~~y(n) —• a~~

$$y(n) - \frac{1}{a[9]}\,y(n-1) - \frac{1}{a(9)}\,y(n-2) = x(n)$$

$a[9] = 6$

1) $$\Rightarrow Y(e^{j\omega})\left[1 - \frac{1}{6}e^{-j\omega} - \frac{1}{6}e^{-2j\omega}\right] = X(e^{j\omega})$$

$$\Rightarrow H(e^{j\omega}) = \frac{1}{\left(1 - \frac{1}{6}e^{-j\omega} - \frac{1}{6}e^{-2j\omega}\right)}$$

2) $$H(e^{j\omega}) = \frac{1}{\left(1 - \frac{1}{2}e^{-j\omega}\right)\left(1 + \frac{1}{3}e^{-j\omega}\right)}$$

$$= \frac{3}{5}\left(\frac{1}{1-\frac{1}{2}e^{-j\omega}}\right) + \frac{2}{5}\left(\frac{1}{1+\frac{1}{3}e^{-j\omega}}\right)$$

$$h(n) = \frac{3}{5}\left(\frac{1}{2}\right)^n u(n) + \frac{2}{5}\left(-\frac{1}{3}\right)^n u(n)$$

3) ∵ Signal is periodic
for $N = 7$

$a_1 = a_{15}$, $a_2 = a_{16}$, $a_3 = a_{17}$.

Also since signal is real & odd, F.S coff a_k will be purely imaginary.

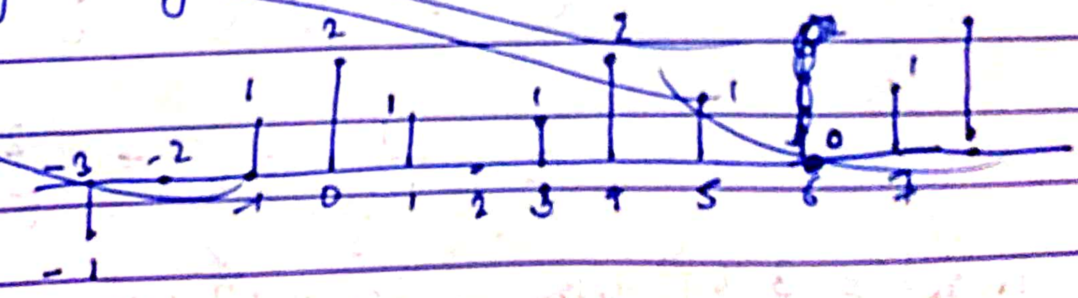
⇒ $a_0 = 0$, $a_1 = -a_{-1}$, $a_2 = -a_{-2}$, $a_3 =$

$$\boxed{\begin{aligned} \Rightarrow a_{-1} &= -a[0]j, \\ a_{-2} &= -a[1]j \\ a_{-3} &= -a[2]j \end{aligned}}$$

4) Refer
Oppenheim Book
Example 9.33

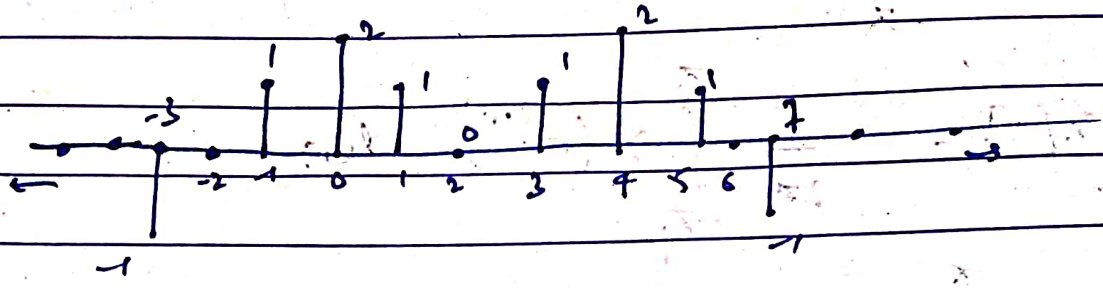
5) ~~a[0] = 1 & a[1] =~~
Solving by $a[0] = 1$, $a[1] = 2$.

$x[n]$ →



5) Solving for $a[0] = 1$

$a[1] = 2$



(a) $X(e^{j0}) = ?$

$$X(e^{j\omega}) = \sum_{n=-\alpha_1}^{\alpha_2} x(n)\, e^{-j\omega n}.$$

$$X(e^{j0}) = \sum_{-3}^{7} x(n) = 6$$

b) $\angle X(e^{j\omega}) =$

~~$x(n) = y($~~

$y(n) = x(n+2)$. is even about $n=2$.

$Y(e^{j\omega}) = e^{j2\omega} X(e^{j\omega})$ is real, even

$\angle Y(e^{j\omega}) = 0 \Rightarrow \angle X(e^{j\omega}) = e^{-j2\omega}$.

(c) $x(n) = \frac{1}{2\pi}\int_{-\pi}^{\pi} X(e^{j\omega})\, e^{j\omega n}\, d\omega$

$x[0] = \frac{1}{2\pi}\int_{-\pi}^{\pi} X(e^{j\omega})\, d\omega$

$\Rightarrow \int_{-\pi}^{\pi} X(e^{j\omega})\, d\omega = 2\pi\, x[0] = 4\pi$

(d) $X(e^{j\pi}) = \sum_{n=\alpha_1}^{\alpha_2} x(n)\, e^{-j\pi n} = \sum_{n=-3}^{7} x(n)\,(-1)^n = 2$