HW 2 :

①

a.) $x[n] = e^{jn\pi/6}$

$\qquad x_{cs}[n] = \frac{1}{2}\left(x[n] + x^*[-n]\right)$

$\qquad x_{cA}[n] = \frac{1}{2}\left(x[n] - x^*[-n]\right)$

$x[n] = e^{jn\pi/6} \qquad x^*[-n] = e^{jn\pi/6}$

$x_{cs}[n] = \frac{1}{2}\left(e^{jn\pi/6} + e^{jn\pi/6}\right) = e^{jn\pi/6}$ ⟲

$x_{cA}[n] = \frac{1}{2}\left(e^{jn\pi/6} - e^{jn\pi/6}\right) = 0$ ⟲

b.) $y[n] = -je^{-jn\pi/2} \qquad y^*[-n] = je^{-jn\pi/2}$

$y_{cs}[n] = \frac{1}{2}\left(-je^{-jn\pi/2} + je^{-jn\pi/2}\right) = 0$ ⟲

$y_{cA}[n] = \frac{1}{2}\left(-je^{-jn\frac{\pi}{2}} - je^{-jn\pi/2}\right) = -je^{-jn\pi/2}$ ⟲

② Z-transform for $x[n] = \left\{-2, \overset{0}{5}, 1, -3, 5, 3\right\}$, $-1 \leq n \leq 4$

and $g[n] = x[n-3]$

$Z\{x[n]\} = 3z^{-4} + 5z^{-3} - 3z^{-2} + z^{-1} + 5 - 2z = X(z)$

$\qquad \overset{\leftarrow\ 2\leq n\leq 7}{}$

$Z\{g[n]\} = 3z^{-7} + 5z^{-6} - 3z^{-5} + z^{-4} + 5z^{-3} - 2z^{-2} = G(z)$

③

$x[n] = \{2, -4, 1, -4\}$ $1 \leq n \leq 4$, $x[n] = 0$ for all other n

$\mathcal{L}_1 \{x[n]\} = ||x[n]||_1 = \sum_{n=1}^{4} (|x[n]|^1)^1$

$||x||_p = \left(\sum_{n=-\infty}^{\infty} |x[n]|^p \right)^{1/p}$

$= 2 + 4 + 1 + 4 = \boxed{\mathcal{L}_1 = 11}$

$||x||_\infty = |x|_{max}$

$\mathcal{L}_2 \{x[n]\} = ||x[n]||_2 = \sum_{n=1}^{4} (|x[n]|^2)^{1/2}$

$= \sqrt{2^2 + 4^2 + 1^2 + 4^2} = \sqrt{37} \Rightarrow \boxed{\mathcal{L}_2 = \sqrt{37}}$

$\mathcal{L}_\infty \{x[n]\} = |x|_{max} = 4$ $\boxed{\mathcal{L}_\infty = 4}$