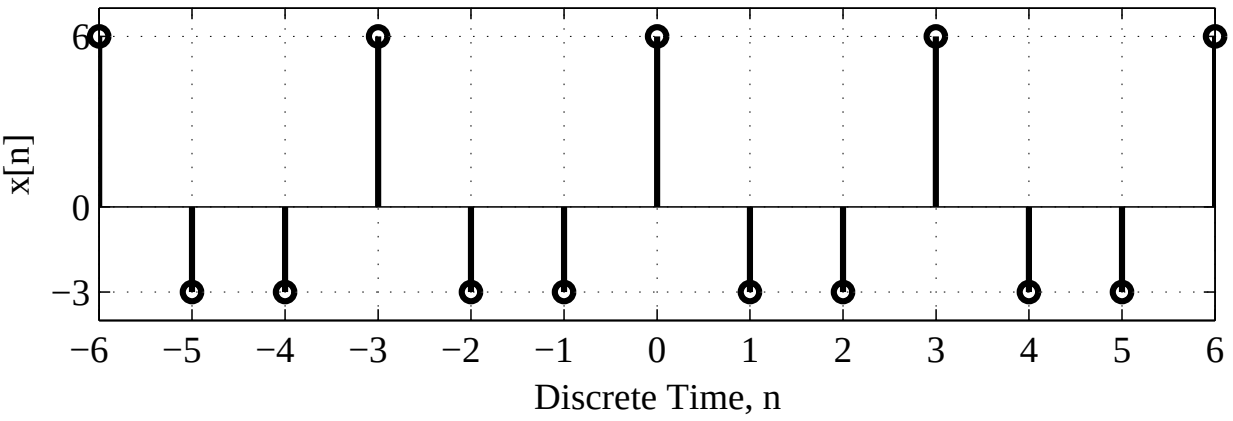
Name: SOLUTIONS

Quiz 4: 10 /10 **ELEC 309 – Signals & Systems**

Consider the periodic sequence $x[n]$ shown below:



(a) (4 points) Determine the fundamental period N_0 and fundamental angular frequency Ω_0.

$$N_0 = \boxed{3 \text{ s}}$$

and

$$\Omega_0 = \frac{2\pi}{N_0} = \boxed{\frac{2\pi}{3} \text{ rad/s.}}$$

(b) (6 points) Determine the Fourier series coefficients $\mathcal{D}_k$.

$$\mathcal{D}_k = \frac{1}{N_0} \sum_{n=<N_0>} x[n] e^{-jk\Omega_0 n} = \frac{1}{3} \sum_{n=-1}^{1} x[n] e^{-jk2\pi n/3}$$

$$= \frac{1}{3} \left[-3e^{+j2\pi k/3} + 6e^{0} - 3e^{-j2\pi k/3} \right] = 2 - \left[e^{+j2\pi k/3} + e^{-j2\pi k/3} \right]$$

$$= 2 - 2 \left[\frac{e^{+j2\pi k/3} + e^{-j2\pi k/3}}{2} \right] = \boxed{2 - 2\cos\left(2\pi k/3\right) = \begin{cases} 0 & k = 0 \\ 3 & k = 1 \\ 3 & k = 2. \end{cases}}$$