

# Assignment-2

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### 1 PROBLEM-OPPENHEIM 2.7-B

- 1.1 Determine whether the following signal is periodic. If the signal is periodic, state its period.

$$x[n] = e^{j(3\pi n/4)}$$

### 2 SOLUTION

#### 2.1 Solution:

A discrete signal  $x[n]$  is said to be periodic when

$$x[n] = x[n + N] \quad (2.1)$$

if discrete signal is periodic then the ration  $\frac{\omega_0}{2\pi}$  must be rational i.e.,  $\frac{m}{N}$  where m = no.of full cycles and N = no. of samples

Now, for the given signal

$$\omega_0 = \frac{3\pi}{4} \quad (2.2)$$

$$\frac{\omega_0}{2\pi} = \frac{3\pi}{4 \times 2\pi} \quad (2.3)$$

$$= \frac{3}{8} \quad (\text{rational}) \quad (2.4)$$

$\therefore$  The signal is periodic with period 8. We can also verify from the plot (2.1)

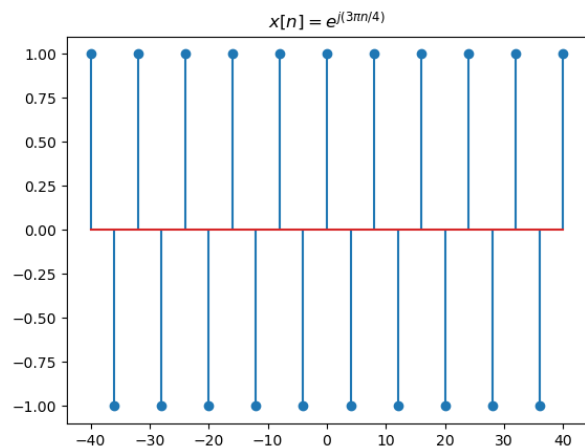


Fig. 2.1: Sketch of  $x[n]$