



ISRA UNIVERSITY

Islamabad Campus

Program: MSc & BSc (Electrical)
Semester – Fall 2018

Signal & Systems

SOLUTION

Quiz – 1(a)

Marks: 10

Handout Date: 29/11/2018

Question # 1:

Determine whether or not the following signal is periodic. If a signal is periodic, specify its fundamental period:

$$x(t) = 2 \cos(10t + 1)$$

Soln

$$x(t) = 2 \cos(10t + 1)$$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{10}$$

$$T = \frac{\pi}{5}, \text{ fundamental period.}$$

$$2) x[n] = u[n]$$

Soln

The signal is periodic because $u[n]$ repeats after every sample and of infinite duration. Hence it is a Power signal.

$$P = \lim_{N \rightarrow \infty} \frac{1}{2N+1} \sum_{-N}^N |x[n]|^2$$

$$= \lim_{N \rightarrow \infty} \frac{1}{2N+1} \sum_{-N}^N |u[n]|^2$$

$$= \lim_{N \rightarrow \infty} \frac{1}{2N+1} \sum_0^N (1)^2$$

$$\text{Since } \sum_0^N (1)^2 = 1 + 1 + 1 + \dots + \infty = (N+1)$$

$$P = \lim_{N \rightarrow \infty} \frac{1}{2N+1} (N+1)$$

$$= \lim_{N \rightarrow \infty} \frac{N \left(1 + \frac{1}{N}\right)}{N \left(2 + \frac{1}{N}\right)} \Rightarrow 0.5W$$

$$P = 0.5W$$