Department of Electrical Engineering
Program: B.E. (Electrical)
Semester - Fall 2016

EL313- Signal & Systems

Assignment – Repeat Solution   **Due Date: 07/12/2016**
Marks: 10   **Handout Date: 05/12/2016**

Question # 1:

Determine the fundamental period of the signal: $x[n] = 1 + e^{\frac{j4\pi n}{7}} - e^{\frac{j2\pi n}{5}}$

Solution:

Step #1: Determine the fundamental period of individual signals.
Period of the first term in the RHS $N_1 = 1$
Period for the second term in the RHS is:

$$\frac{N}{m} = \frac{2\pi}{\omega_0}, where\ \omega_0 = \frac{4\pi}{7}$$

$$\frac{N}{m} = \frac{2\pi}{\frac{4\pi}{7}} \Longrightarrow \frac{7}{2}$$

Where $N_2 = 7$ and $m = 2$.
Period for the third term in the RHS is:

$$\frac{N}{m} = \frac{2\pi}{\omega_0}, where\ \omega_0 = \frac{2\pi}{5}$$

$$\frac{N}{m} = \frac{2\pi}{\frac{2\pi}{5}} \Longrightarrow 5$$

Where $N_3 = 5$ and $m = 1$.

Step #2: Find the ratio of fundamental period of 1st signal to fundamental period of every other signal.

$$\frac{N_1}{N_2} \Longrightarrow \frac{1}{7}, \frac{N_1}{N_3} \Longrightarrow \frac{1}{5}$$

Step #3: If the ratios are rational, the composite signal is periodic.
Hence above two ratios are rational so the signal x [n] is periodic.
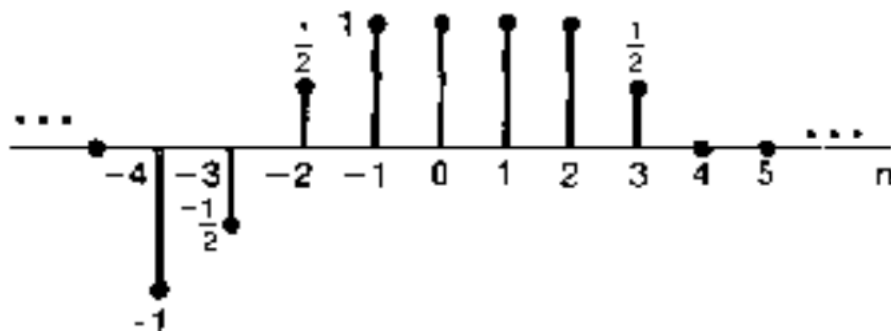
Step #4: $N_0 = LCM(N_1, N_2, N_3)$
$$LCM = 1 \times 7 \times 5 \Longrightarrow 35$$
Therefore, the overall signal x [n] is periodic with a period which is least common multiple of the period of the three terms in x [n]. This is equal to 35.
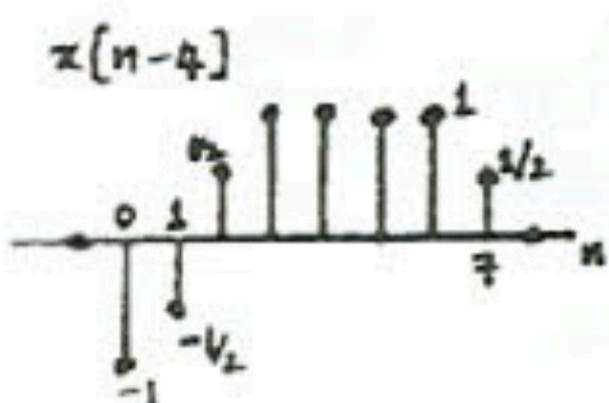
Question # 2:
A continuous-time signal x(t) is shown in figure below. Sketch and label each of the following signals:
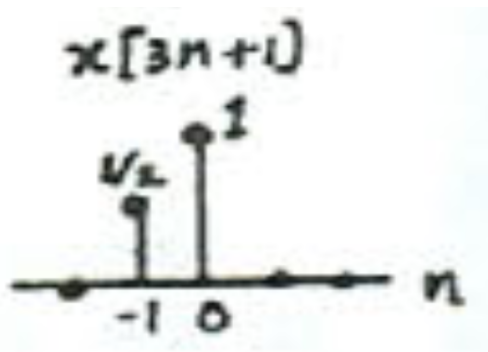
1. $x[n-4]$
2. $x[3n+1]$
3. $x[3n]$

Solution:

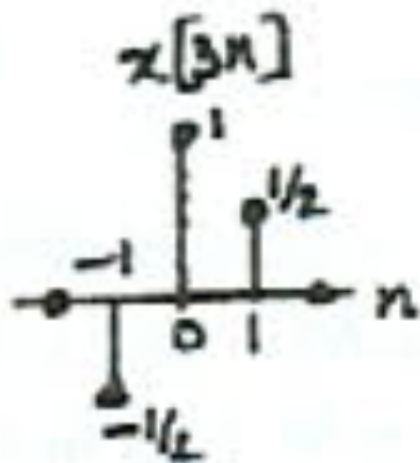1. $x[n-4]$

2. $x[3n+1]$

3. $x[3n]$

$x[3n]$

1

1/2

-1

0 1

n

-1/2

Good Luck