School of Electronics Engg

ECE1004 Signal Processing

F1+TF1

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Assignment I

1. Determine linearity, time invariant, causality, stability and memory requirements of the following systems:
   i) $y[n] = x[-n] + nx[n]$
   ii) $y[n] = cos[x(n)]$

2. Find whether the following signals are periodic and if periodic find the fundamental period of the signals.

   i) $\sin\left(\frac{7}{3}n + 1\right) + \frac{3}{5}\cos\left(\frac{3\pi}{7}n + 1\right)$

   ii) $\frac{3}{5}e^{j3\pi\left(n+\theta\right)} + \frac{2}{7}e^{j4\pi\left(n+\theta\right)}$

3. Find whether the following signals are energy signal or power signal
   i) $x[n] = r(n) - r(n - N)$
   ii) $x(n) = e^{\,j(2n+\pi/8)}$

4. Plot pole-zero plot of the given system and comment on stability and causality.
$$y[n] - \left(\frac{3}{4}\right)y[n-1] + \left(\frac{1}{8}\right)y[n-2] = x[n] - x[n-1]$$

5. Perform convolution on following sequence
   $$x[n] = (^{1}/_{2})^{n}u[n-4] \text{ and } h[n] = 4^{n}u[-n-1]$$

6. Find the Even and Odd part of the signal
   $$y[n] = (r[n] + r[-n])\{u[n+3] - u[n-5]\}$$

7. For the given input signals, plot $x(3 - n)y(2-0.5n)$
   $$x[n] = \overset{\uparrow}{\{2, -1, 3, 1, 0, 0, 2, 3\}}$$
   $$y[n] = (r[n] + r[-n])\{u[n+3] - u[n-5]\}$$

8. Find ZT for the following and plot ROC

i) $x[n] = \{2, -1, 3, \underset{\uparrow}{1}, 0, 0, 2, 3\}$

ii) $x[n] = r(n) - r(n - N)$