DSP Practice Test #1.B

Name: _____ Start Time: _____

Problem 1:

A) Let $y[n] = \frac{1}{4}y[n-1] + x[n] + 2x[n-2]$,

Find the frequency response, $H(\omega)$, of the system

B) Let $H(z) = \frac{1 + 3z^{-1}}{\left(1 - \frac{1}{3}z^{-1}\right)\left(1 + \frac{1}{5}z^{-1}\right)}$

Find the causal impulse response, $h[n]$, of the system with this frequency response.

Problem 2:

Given the code below answer the following questions.

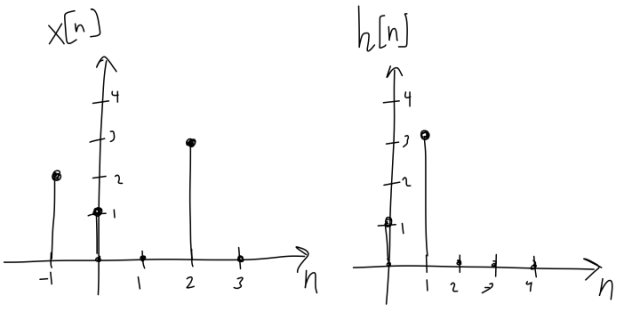
```
x = @(n)exp(1j*pi/4*n);
n=0:99;
y = filter([1,3],[1,2/15,1/15],x(n));
```

A) Explain what this sequence of MATLAB commands does

B) Write code to plot the output of the filter command.

C) Write down a closed-form expression for the output $y[n]$, given the input $x[n]$

Problem 3:



Let: $x[n] = 2\delta[n+1] + \delta[n] + 3\delta[n-2] \quad h[n] = \delta[n] + 3\delta[n-1]$

A) Find $y[n] = x[n] * h[n]$. Show and explain your steps

B) Let $x[n] = 2\delta[n-1] - 3^n u[-n-1]$. Find the z-transform of $x[n]$, and specify the ROC. (Do not simplify the z-transform to a single term.)

Problem 4:

Let $y[n] = (n+1)x[n-1]$For each property, indicate by circling the appropriate term what can be shown to be true about the system. Also explain your reasoning.

A) The system is Linear/ Nonlinear / Not Enough Info

B) The system is Causal / Noncausal / Not Enough Info

C) The system is Time-variant / Time-Invariant / Not Enough Info

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D) The system is Stable / Unstable / Not Enough Info