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| King Saud UniversityComputer Engineering DepartmentCollege of Computer and Information Sciences |
| **HW # 2: CEN352** |
| Name: ID: |

**Problem 1: (Z-transform)**

Given the following difference equation with the input-output relationship of a certain initially relaxed system (all initial conditions are zero)

 𝒚(𝒏)−𝟎.𝟓 𝒚(𝒏−𝟏)+𝟎.𝟏𝟐𝟓 𝒚(𝒏−𝟐) =𝒙(𝒏)

Find the impulse response sequence due to the impulse sequence (use Z-transform).

**Problem 2: (FIR filter)**

Design a 5-tap FIR high-pass filter with a cut-off frequency of 1600 Hz and a sampling rate of 8000 Hz using a Hamming window function. Determine the transfer function and difference equation of the designed FIR system.

**Problem 3: (IIR filter)**

The normalized low-pass filter with a cutoff frequency of 1 rad/sec is given as: $H\_{p}\left(s\right)=\frac{1}{s+1}$.

1. Use $H\_{p}\left(s\right)$ and the BLT to obtain a corresponding IIR digital high-pass filter with a cutoff frequency of 1Khz, assuming a sampling rate 8Khz.
2. Use MATLAB to plot the magnitude and phase frequency responses of $H\left(z\right).$

Hint: The BLT is given by: $s=\frac{2}{T} \frac{z-1}{z+1}$.