DSP Assignment-7 Questions

1. Find the values of $h(n)$ for an ideal BPF with a frequency response
   $H_d(e^{j\omega}) = 1$ for $\frac{\pi}{4} \leq |\omega| \leq \frac{3\pi}{4}$
   $= 0$ otherwise
   And N = 11.

2. Design a filter using hamming window (N = 7) with
   $H_d(e^{j\omega}) = e^{-3j\omega}$ for $-\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4}$
   $= 0$ for $\frac{\pi}{4} \leq |\omega| \leq \pi$

3. Determine the frequency response of FIR filter defined by $y(n) = 0.25x(n) + x(n-1) + 0.25x(n-2)$. Calculate the phase delay and group delay.

4. If $H(z)$ has zeros at $z_1 = \frac{1}{\sqrt{2}} + \frac{j}{\sqrt{2}}, z_2 = 2$. Determine the lowest degree $H(z)$ that has a linear phase.

5. Determine the filter coefficients h(n) obtained by sampling:
   $H_d(e^{j\omega}) = e^{-j\omega(N-1)/2}$ for $0 \leq |\omega| \leq \frac{\pi}{2}$
   $= 0$ for $\frac{\pi}{2} \leq |\omega| \leq \pi$
   For N=7.

6. Develop a minimum-multiplier realization of a length 9 Type-3 FIR filter function.

7. A.

A Digital Filter is defined by the difference equation

```
y[n] = 0.99 y[n - 1] + x[n]
```

The filter is clearly recursive. Determine the impulse response `h[n]`.

a) Is the filter stable?

b) Would you classify it as Low Pass, Band Pass ... or what?

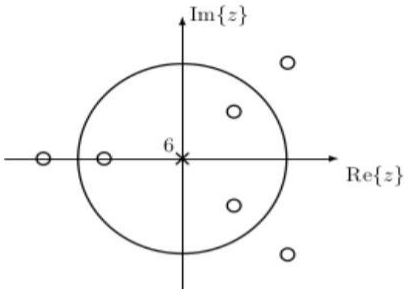
B.

A Digital Filter has frequency response $H(\omega)$ such that

$$0.95 \le |H(\omega)| \le 1.05 \quad \text{for} \quad 0 \le \omega \le 0.3\pi$$
$$0 \le |H(\omega)| \le 0.005 \quad \text{for} \quad 0.4\pi \le \omega \le \pi$$

Also let the sampling frequency be Fs=8 KHz. Determine the pass band and stop band frequency in KHz, the pass band ripple and the stop band attenuation in dB.

8. What "type" of filter is it? Justify



9. Determine the coefficient of h(n) of a linear phase FIR filter of length 15.

$$H_r\left(\frac{2\pi k}{15}\right) = \begin{cases} 1 & k = 0, 1, 2, 3 \\ 0.4 & k = 4 \\ 0 & k = 5, 6, 7 \end{cases}$$

10.

Consider the pole–zero plot shown in Fig.
(a) Does it represent an FIR filter?
(b) Is it a linear-phase system?