Exercise IIR(1)

Consider the following Butterworth 3rd order low-pass filter (frequency normalized filter)

$$H(s) = \frac{1}{s+1} \cdot \frac{1}{s^2+s+1}$$

Please design a corresponding digital low-pass filter with a cut-off frequency of 1 kHz, and sample frequency of 8 kHz.

1. Design a digital low-pass filter $H_1(z)$ using matched z-transform.
2. Design a digital low-pass filter $H_2(z)$ using impulse invariant z-transform.
3. Use MATLAB to compare Bode plots for these 3 filters $H(s)$, $H_1(z)$ and $H_2(z)$.
4. Use MATLAB to compare the impulse responses of $H(s)$, $H_1(z)$ and $H_2(z)$.