(1)   A low pass filter meeting the following specification is required:

Passband	-	0-500Hz
Stopband	-	2-4KHz
Passband ripple	-	3dB
Stopband attenuation	-	20dB

Determine following:

(i).Pass and stopband edge frequencies for a suitable analog prototype low pass filter.

(ii).Order N of the prototype low pass filter.

(iii).Coefficients and hence the transfer function of the discrete time filter using the bilinear z-

transform.

Assume Butterworth characteristics of the filter.   (16)

(2)

Design a Butterworth digital filter using bilinear transformation that satisfy the following specifications

$0.89 \leq |H(\omega)| \leq 1.0; \quad 0 \leq \omega \leq 0.2\pi$

$|H(\omega)| \leq 0.18; \quad 0.3\pi \leq \omega \leq \pi$

(3)

The specification of the desired lowpass digital filter is

$0.9 \leq |H(\omega)| \leq 1.0; \quad 0 \leq \omega \leq 0.25\pi$

$|H(\omega)| \leq 0.24; \quad 0.5\pi \leq \omega \leq \pi$

Design a Chebyshev digital filter using ~~impulse   invariant~~ BT

~~transformation.~~

(4) Find the magnitude and phase response of the following DTFT

(a) x(n)= a^n u(n) +b^n u(-n-1)

(b) x(n)= {1,3,5,2}

(4)

Design a digital Butterworth filter satisfying the constraints

$$0.707 \leq \left| H\left(e^{iw}\right) \right| \leq 1 \text{ for } 0 \leq w \leq \pi/2$$
$$\left| H\left(e^{iw}\right) \right| \leq 0.20 \text{ for } {}^{3\pi}\!/_{4} \leq w \leq \pi$$

With T = 1 sec using Bilinear transformation. ~~Realize the same in Direct form II.~~