Tutorial Sheet No.—10

question no. 01:— Convert the analog filter with system function

$$H_a(s) = \frac{s+0.1}{(s+0.1)^2+16}$$

with resonant frequency $\Omega_r = 4$, into a digital IIR filter by means of the bilinear transformation. The digital filter is to have a resonant frequency of $\omega_r = \pi/2$.

question no. 02:— Convert the analog filter with system function $H_a(s) = \frac{s+0.1}{(s+0.1)^2+9}$ into a digital IIR filter by means of the impulse invariance method.

question no. 03:— Find the transfer function $H(s)$ for the normalized Butterworth filter of order $N=2$ with cutoff frequency $\Omega_c = 1$ rad/sec. Plot the pole-zero diagram for this Butterworth filter.

Design an IIR filter using this $H(s)$ for Butterworth filter using the method of approximation of derivatives. (Obtain $H[z]$ for this lowpass Butterworth filter).

Note:— Consider $T = 0.1$ in question no. 02 and question no. 03.