

3, a

'b' and 'a' are coefficients for different combinations of r and angle is given:

3, a. $r \in 0, 1$, $\theta \in 0, \pi$

$r = 0.2$ $\theta = 0 = \cos 0 = 1$

$r = 0.5$ $\theta = \pi/4 = \cos \pi/4 = 1/2$

$r = 0.8$ $\theta = \pi/2 = \cos \pi/2 = 0$

$\theta = \pi$ $\cos \pi = -1$

$\theta = 3\pi/4$ $\cos 3\pi/4 = -1/2$

$\theta = 5\pi/4$ $\cos 5\pi/4 = -1/2$

$\theta = 7\pi/4$ $\cos 7\pi/4 = 1/2$

$\theta = \pi$ $\cos \pi = -1$

① $\Rightarrow H(z) = \frac{1 - (2r \cos \theta) z^{-1} + r^2 z^{-2}}{1 - (2r \cos \theta) z^{-1} + r^2 z^{-2}}$

② $H(z) = \frac{1 - 2z^{-1} + z^{-2}}{1 - 0.4z^{-1} + 0.04z^{-2}}$

$b = [1, -2, 1]$

$a = [1, -0.4, 0.04]$

③ $H(z) = \frac{1 - z^{-1} + z^{-2}}{1 - 0.5z^{-1} + 0.25z^{-2}}$

$b = [-1, 1]$

$a = [1, -0.5, 0.25]$

④ $H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 + 2z^{-1} + z^{-2}}$

$b = [1, 2, 1]$

$c = [1, 1.6, 0.64]$

3, b

Yes. For this the ROC should contain the unit circle and it should be outside of the outermost pole.

3.c. calculation of b and a coefficients :

$\lambda = 0.95$
 $\theta = 0 \Rightarrow \cos \theta = 1$
 $H(z) = \frac{1 - 2\cos\theta z^{-1} + z^{-2}}{1 - 2\lambda\cos\theta z^{-1} + \lambda^2 z^{-2}}$
 $= \frac{1 - 2z^{-1} + z^{-2}}{1 - 1.9z^{-1} + 0.9z^{-2}}$

$b = [1 \ -2 \ 1]$
 $a = [1 \ -1.9 \ 0.9]$

$\lambda = 0.95$
 $\theta = \pi/3 \Rightarrow \cos \theta = 1/2$
 $H(z) = \frac{1 - z^{-1} + z^{-2}}{1 - 0.95z^{-1} + 0.9z^{-2}}$

$\lambda = 0.95$
 $\theta = \pi \Rightarrow \cos \theta = -1$
 $H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 + 1.9z^{-1} + 0.9z^{-2}}$

$b = [1 \ 2 \ 1]$
 $a = [1 \ 1.9 \ 0.9]$

3,d. calculation of b and a coefficients :

(3,d) $\theta = 60^\circ \Rightarrow \cos 60^\circ = \frac{1}{2}$

$r = 0.2$

$$H(z) = \frac{1 - z^{-1} + z^{-2}}{1 - 0.2z^{-1} + 0.04z^{-2}}$$
$$b = [1 \quad -1 \quad 1]$$
$$a = [1 \quad -0.2 \quad 0.04]$$

$r = 0.5$

$$H(z) = \frac{1 - z^{-1} + z^{-2}}{1 - 0.5z^{-1} + 0.25z^{-2}}$$
$$b = [1 \quad -1 \quad 1]$$
$$a = [1 \quad -0.5 \quad 0.25]$$

$r = 0.8$

$$H(z) = \frac{1 - z^{-1} + z^{-2}}{1 - 0.8z^{-1} + 0.64z^{-2}}$$
$$b = [1 \quad -1 \quad 1]$$
$$a = [1 \quad -0.8 \quad 0.64]$$

3,e .

Magnitude response of any system depends upon the location of poles and zeros.