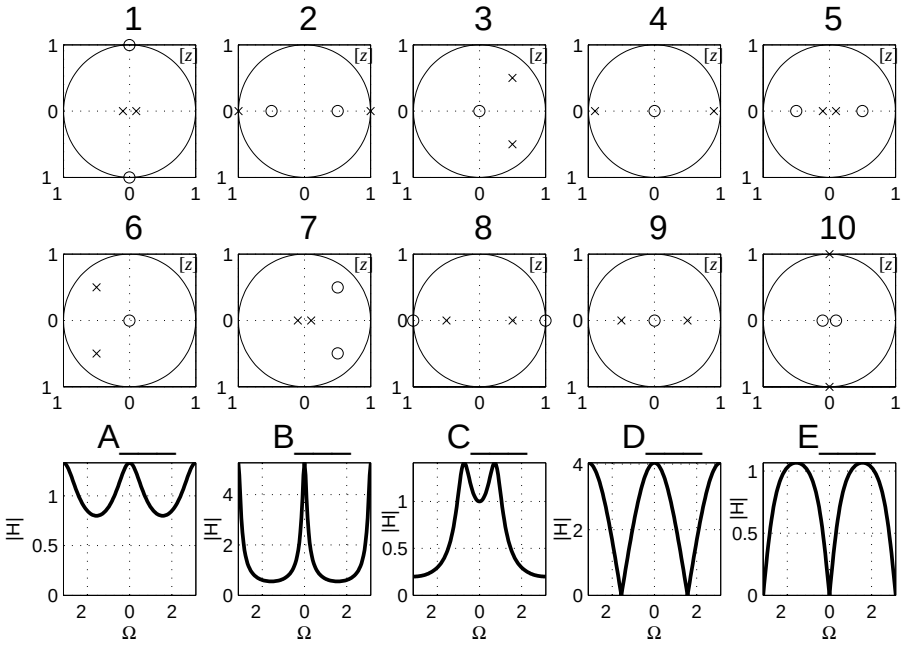
Solution to ECE Test #11 S09

1. Write in the space provided the number of the pole-zero plot which matches each magnitude frequency response graph.



A-9 , B-4, C-3, D-1, E-8

2. A DT feedback system has a forward path transfer function $\mathrm{H}_1(z) = \dfrac{Kz}{z-0.5}$ and a feedback path transfer function $\mathrm{H}_2(z) = 4z^{-1}$. For what range of values of *K* is the system stable?

$$\mathrm{H}(z) = \frac{\dfrac{Kz}{z-0.5}}{1+\dfrac{Kz}{z-0.5}\dfrac{4}{z}} = \frac{Kz^2}{z^2-0.5z+4Kz} = \frac{Kz}{z+4K-0.5}$$

$$z+4K-0.5=0 \Rightarrow z = 0, 0.5-4K$$

For stability,

$$|0.5-4K|<1 \Rightarrow -1/8 < K < 3/8$$

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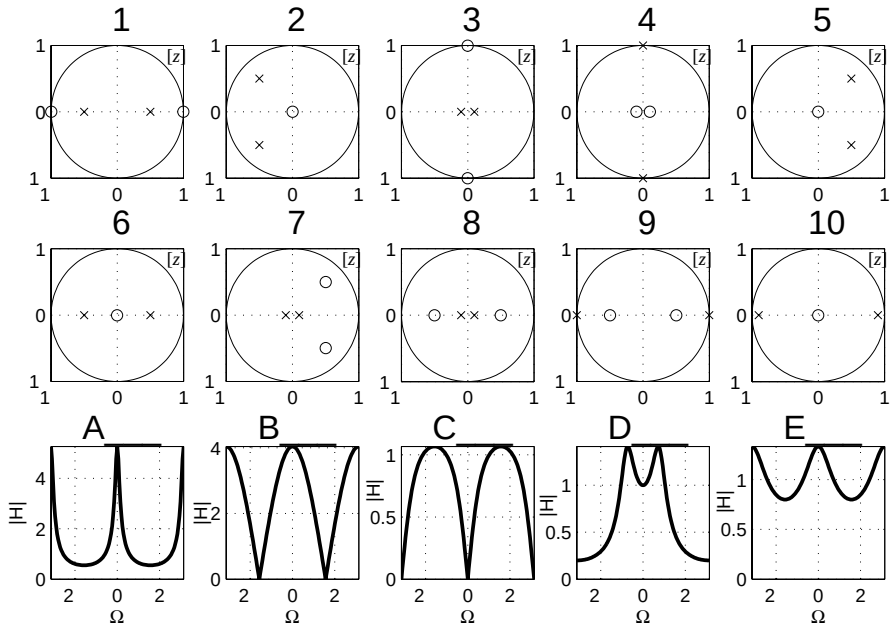

A-10, B-3, C-1, D-5, E-6

2. A DT feedback system has a forward path transfer function $\mathrm{H}_1(z)=\dfrac{Kz}{z+0.5}$ and a feedback path transfer function $\mathrm{H}_2(z)=2z^{-1}$. For what range of values of *K* is the system stable?

$$\mathrm{H}(z)=\frac{\dfrac{Kz}{z+0.5}}{1+\dfrac{Kz}{z+0.5}\dfrac{2}{z}}=\frac{Kz^2}{z^2+0.5z+2Kz}=\frac{Kz}{z+2K+0.5}$$

$$z+2K+0.5=0\Rightarrow z=0,-0.5-2K$$

For stability,

$$\left|-0.5-2K\right|<1\Rightarrow -3/4<K<1/4$$