1) Use Matlab™ to plot the root locus for the following problem as $K$ varies from 0 to $+\infty$.

\[
\begin{array}{c}
\text{R}(s) \\
\downarrow \\
\circ \\
\downarrow \\
K \\
\downarrow \\
d\frac{1}{s(s + 9)(s + 12)} \\
\downarrow \\
\text{C}(s)
\end{array}
\]

For each of the following conditions considered separately, determine (from the root locus) the approximate values of $K$, if any, that will give a system with

a) dominant 2nd order roots with a damping ratio of 0.50
b) peak time of 2.0 seconds for a step input
c) settling time of 4.0 seconds for a step input.

⇒ You should generate 3 different values for $K$! ⇐

2) Check your results for #1a, #1b, and #1c by performing Simulink™ simulations with your three selected values of $K$. Discuss the agreement between the results estimated from the root locus and the simulations.

3) Use Matlab™ to plot the root locus for the following problem as $K$ varies from 0 to $+\infty$.

\[
\begin{array}{c}
\text{R}(s) \\
\downarrow \\
\circ \\
\downarrow \\
K \frac{s+6}{s(s+5)(s+10)} \\
\downarrow \\
\text{C}(s)
\end{array}
\]

For each of the following conditions considered separately, determine (from the root locus) the approximate values of $K$, if any, that will give a system with

a) dominant 2nd order roots with a damping ratio of 0.707
b) peak time of 1.0 second for a step input
c) settling time of 2.0 seconds for a step input.

⇒ You should generate 3 different values for $K$! ⇐

4) Check your results for #2a, #2b, and #2c by performing Simulink™ simulations with your three selected values of $K$. Discuss the agreement between the results estimated from the root locus and the simulations.