



Part 1)

a) Plant Transfer Function

$$L(s) = \frac{1}{s-1}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{0, 0.5, 1, 1.5, 2\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = 1/(s-1)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) On a new graph plot the output, $y(t)$, step response for each $K = \{0, 0.5, 1, 1.5, 2\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = 1/(s-1)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

b) Plant Transfer Function

$$L(s) = \frac{s+1}{s-1}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{0.5, 1, 2, 3, 4, 5, 10, 20, 30\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = (s+1)/(s-1)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) On a new graph plot the output, $y(t)$, step response for each $K = \{0.5, 2, 4, 10, 30\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = (s+1)/(s-1)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

c) Plant Transfer Function

$$L(s) = \frac{s - 1}{s + 1}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{0.5, 1, 2, 5, 10, 20, 40\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = (s-1)/(s+1)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) On a new graph plot the output, $y(t)$, step response for each $K = \{0.5, 2, 5, 10, 40\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = (s-1)/(s+1)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

Part 2)

a) Plant Transfer Function

$$L(s) = \frac{2}{s(s + 2)}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{1, 5, 10, 15, 20, 40\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = 2/s(s+2)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) Find the K value such that the closed loop poles become complex. Find this value analytically.
- iv) On a new graph plot the output, $y(t)$, step response for each $K = \{1, 10, 20, 40\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = 2/s(s+2)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

b) Plant Transfer Function

$$L(s) = \frac{s + 2}{s(s - 2)}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{0.25, 0.5, 1, 2, 4, 8, 16\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = (s+2)/s(s-2)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) Find the minimum K value such that the closed loop system is stable. Find this value analytically.
- iv) On a new graph plot the output, $y(t)$, step response for each $K = \{1,4,8,16\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = (s+2)/s(s-2)$ ')

Get this graph initialed by the TA and turn in as part of your lab report.

c) Plant Transfer Function

$$L(s) = \frac{(S + 2)(S+4)}{4S(S - 2)}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{0.25,0.5,1,2,4,8,16,32,64\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = (s+2)(s+4)/4s(s-2)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) Find the K value such that the closed loop poles become complex. Find this value analytically.
- iv) Find the minimum K value such that the closed loop system is stable. Find this value analytically.
- v) On a new graph plot the output, $y(t)$, step response for each $K = \{1,4,16,64\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = (s+2)(s+4)/4s(s-2)$ ')

Get this graph initialed by the TA and turn in as part of your lab report.

d) Plant Transfer Function

$$L(s) = \frac{8}{S(S + 2)(S+4)}$$

- i) Create the root locus plot of the closed loop poles for the above system as K varies using the *rlocus* command.
- ii) On the root locus plot just created plot the closed loop poles for the above system for $K = \{0.25,0.5,1,2,4,8\}$. Label each closed loop pole with the corresponding K value. Give the graph a title (for example 'Root Locus for $L(s) = 8/s(s+2)(s+4)$ ').

Get this graph initialed by the TA and turn in as part of your lab report.

- iii) Find the minimum K value such that the closed loop system becomes unstable. Find this value analytically or use MATLAB to find this K value
- iv) On a new graph plot the output, $y(t)$, step response for each $K = \{0.25,0.5,1,2,4,8\}$. Label each step response with the corresponding K value. Give the graph a title (for example 'Step Responses for $L(s) = 8/s(s+2)(s+4)$ ')

Get this graph initialed by the TA and turn in as part of your lab report.