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ECE-320, Quiz #4

1) Assuming we are going to use the linear quadratic method for determining a closed loop transfer function $G_o(s)$ by minimizing the following expression:

$$J = \int_0^\infty \left[q(r(t) - y(t))^2 + u^2(t) \right] dt$$

Consider the response of the resulting closed loop system as the weighting parameter q is **decreased**

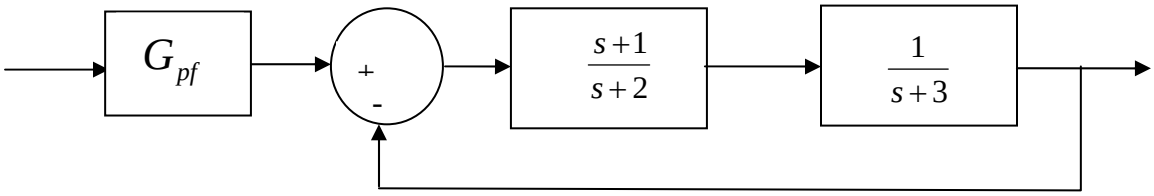
i) nothing will change ii) the settling time will decrease iii) the settling time will increase

iv) the control effort will decrease v) the control effort will increase

Which of the following is most likely to happen:

a) *i* b) *ii* and *iv* c) *ii* and *v* d) *iii* and *iv* e) *iii* and *v*

2) Consider the closed loop system below:



If we want to use a dynamic prefilter to **cancel the closed loop zero** and produce a **zero steady state error for a unit step**, we should choose the prefilter as

a) $G_{pf}(s) = \frac{1}{s+1}$ b) b) $G_{pf}(s) = \frac{5}{s+1}$ c) $G_{pf}(s) = \frac{6}{s+1}$ d) $G_{pf}(s) = \frac{7}{s+1}$

3) Is $G_{pf}(s) = \frac{1}{(s-1)(s+2)}$ an acceptable prefilter (for any system)?

a) Yes b) No

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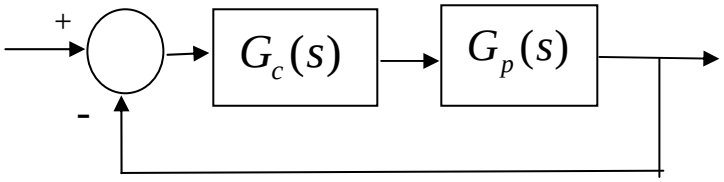
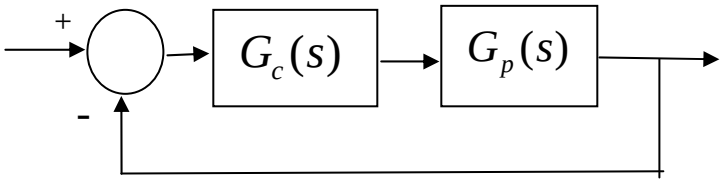
4) For the following system



if the plant is $G_p(s)=\dfrac{3}{s+2}$ and the desired closed loop transfer function is $G_0(s)=\dfrac{4s+4}{s^2+4s+4}$, then the required controller is

a) $G_c(s)=\dfrac{4(s+1)(s+2)}{3s}$ b) $G_c(s)=\dfrac{(s+2)}{3s^2}$ c) $G_c(s)=\dfrac{4(s+1)(s+2)}{3s^2}$ d) none of these

5) For the following system



if the plant is $G_p(s)=\dfrac{2}{s+1}$ and we use quadratic optimal control with $q=6$, then the closed loop transfer function is

a) $G_0(s)=\dfrac{24}{s+5}$ b) $G_0(s)=\dfrac{24}{s+25}$ c) $G_0(s)=\dfrac{12}{5(s+5)}$ d) $G_0(s)=\dfrac{24}{5(s+5)}$

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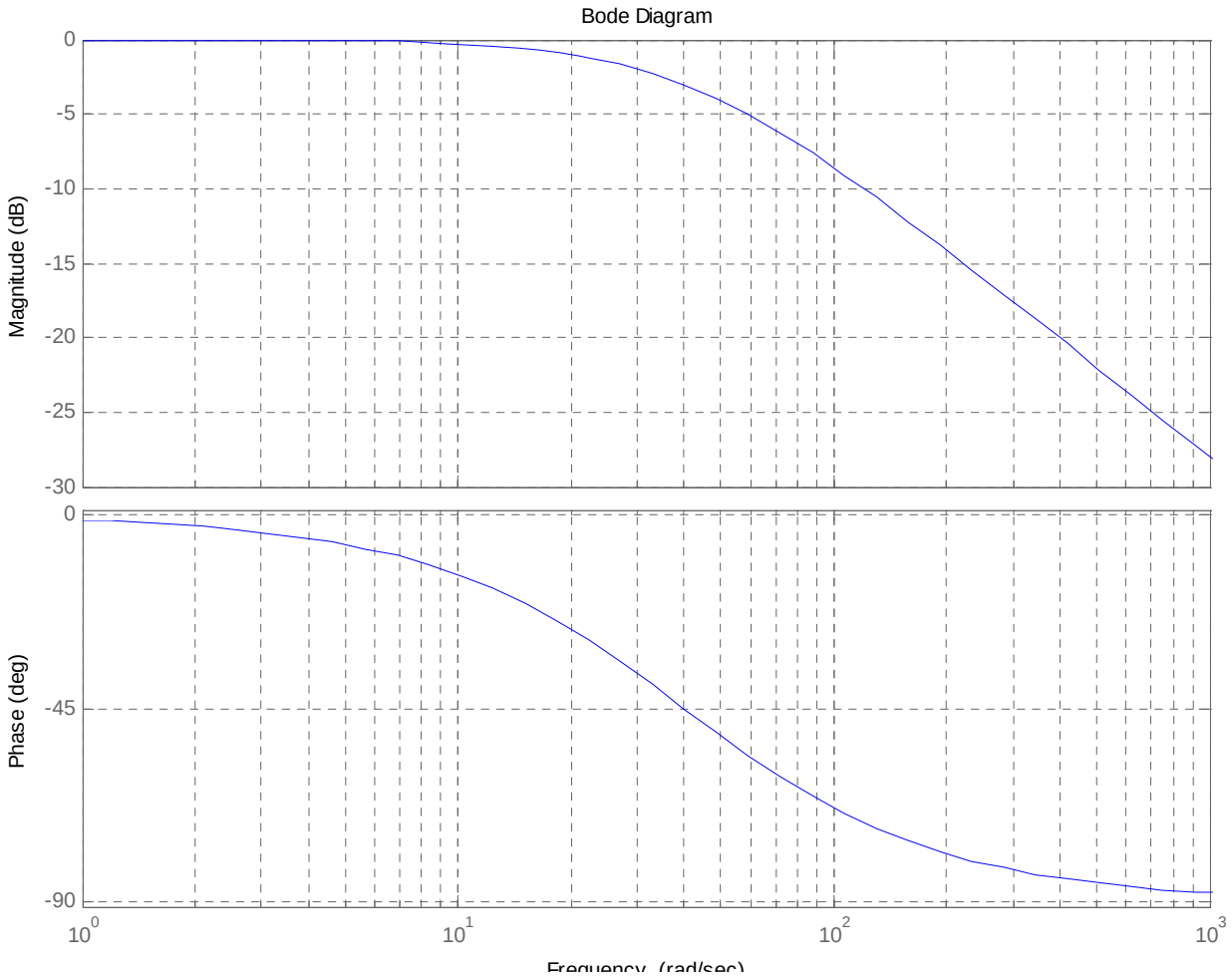
6) For a system represented by the following Bode plot,



The (2%) settling time for this system is approximately

a) $\frac{1}{40}$ sec b) $\frac{4}{20}$ sec c) $\frac{1}{10}$ sec d) 40 sec e) none of these