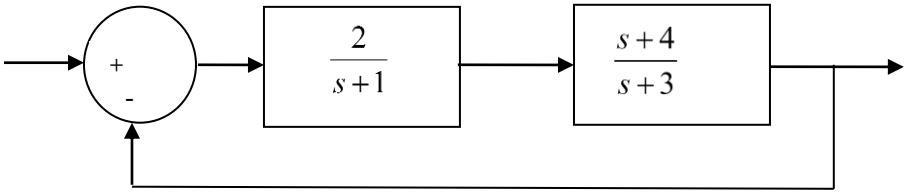
ECE-320, Practice Quiz #3

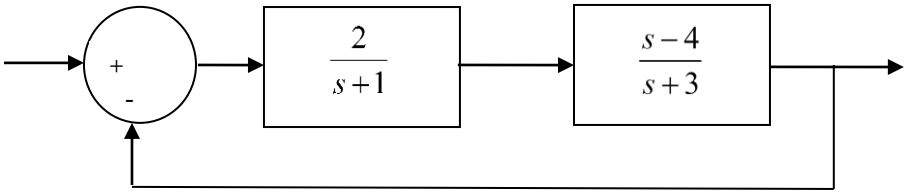
1) For the following system



The dynamic prefilter which cancels the closed loop zeros and produces a zero steady state error for a unit step input is

a) $\frac{\frac{11}{8}}{s+4}$ b) $\frac{\frac{11}{2}}{s+4}$ c) $\frac{11}{s+4}$ d) $\frac{\frac{3}{2}}{s+4}$

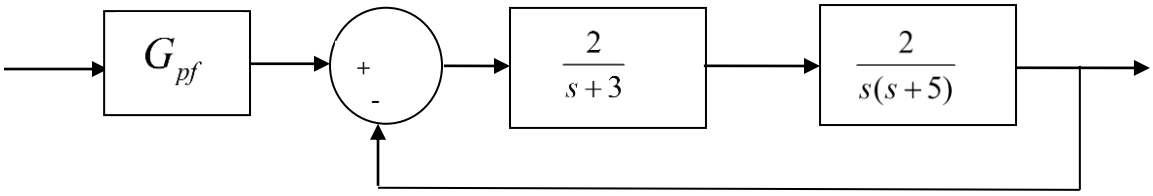
2) For the following system, is it possible to construct a dynamic prefilter to cancel the closed loop zero and produce a zero steady state error for a unit step input?



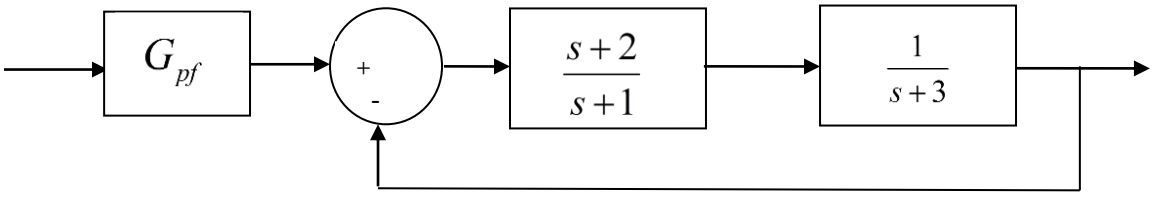
a) yes b) no

3) For the block diagram below, the value of the prefilter G_{pf} that produces zero **<u>steady state error</u>** for a unit step input is:

a) 1 b) 3/2 c) 3 d) 1/3



Problems 4-6 refer to the following system:



4) Assuming the prefilter G_{pf} is 1, the **position error constant** K_p is best approximated as

a) 2/3 b) 2/5 c) 1 d) 0

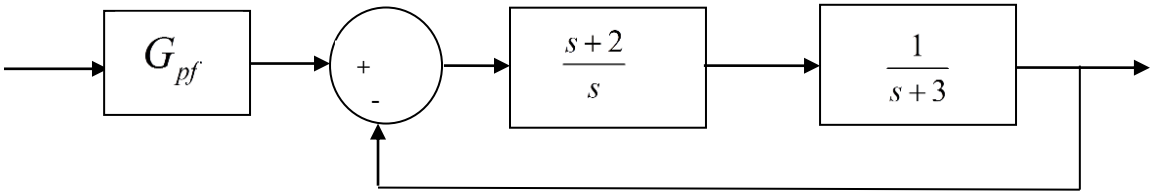
5) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit step is best approximated as

a) 1/3 b) 3/2 c) 3/5 d) 2/5

6) The value of the prefilter G_{pf} that produces **a steady state error** of zero is:

a) 1 b) 3/2 c) 5/2 d) 1/3

Problems 7-9refer to the following system



7) Assuming the prefilter G_{pf} is 1, the **velocity error constant** K_v is best approximated as

a) 2/3 b) 2/5 c) 1 d) 0

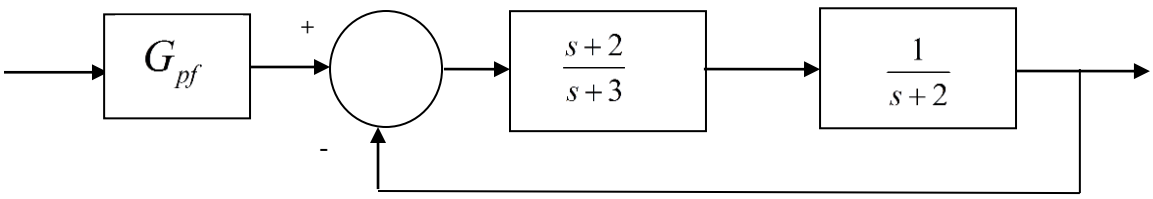
8) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit ramp input is best approximated as

a) 1/3 b) 3/2 c) 3/5 d) 2/5

9) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit step input is best approximated as

a) ∞ b) 0 c) 3/5 d) 2/5

Problems 10- 12 refer to the following system:



10) Assuming the prefilter G_{pf} is 1, the **position error constant** K_p is best approximated as

a) 2/3 b) 1/3 c) 1 d) 0

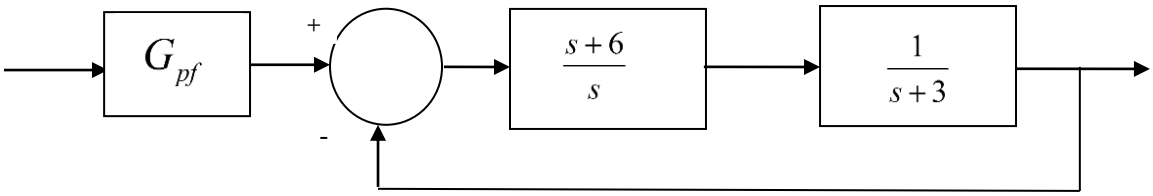
11) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit step is best approximated as

a) 1/3 b) 2/3 c) 3/4 d) 4/3

12) The value of the prefilter G_{pf} that produces **a steady state error** of zero is:

a) 1 b) 3/2 c) 4 d) 1/3

Problems 13-15 refer to the following system



13) Assuming the prefilter G_{pf} is 1, the **velocity error constant** K_v is best approximated as

a) 2/3 b) 2 c) 1 d) 0

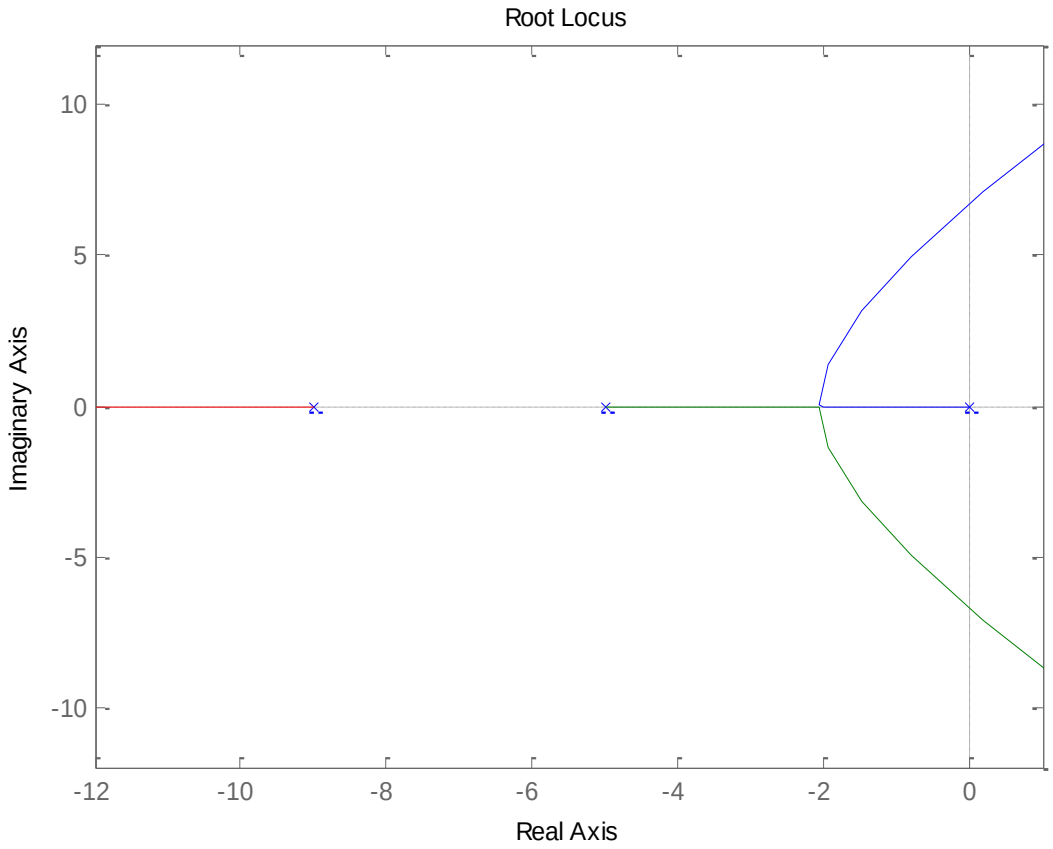
14) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit ramp input is best approximated as

a) 1/2 b) 3/2 c) 2 d) 2/5

15) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit step input is best approximated as

a) ∞ b) 0 c) 3/5 d) 2

Problems 16 and 17 refer to the following root locus plot.



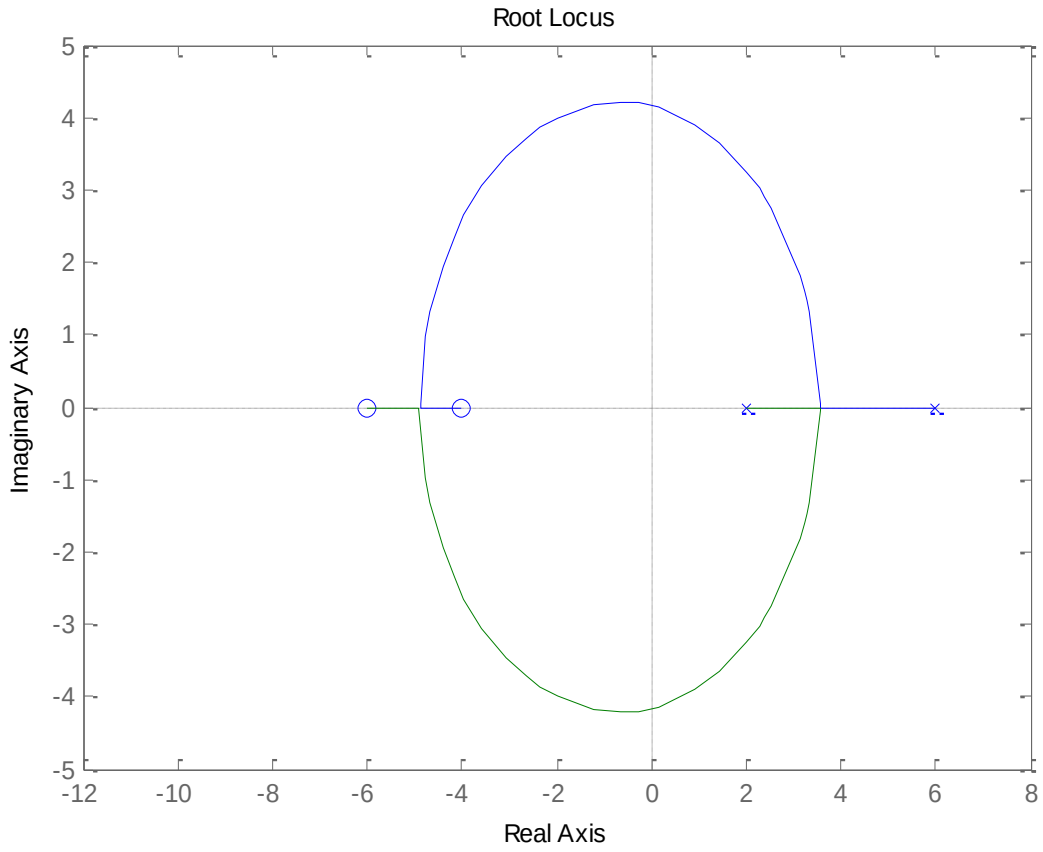
16) Is it possible to find a value of *k* so that -6 is a closed loop pole?

a) Yes b) No

17) When k = 623 two poles of the closed loop system are purely imaginary. In order for the system to remain stable

a) $0 < k < 623$ b) $k > 623$ c) $k > 0$ d) $k < 0$

Problems 18 and 19 refer to the following root locus plot



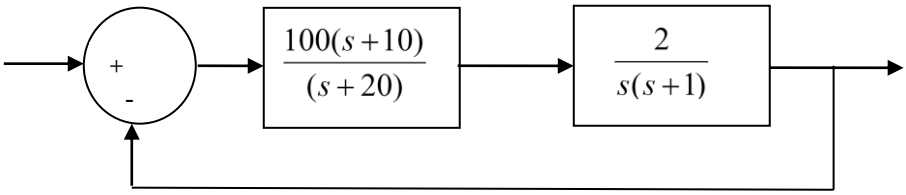
18) Is it possible to find a value of *k* so that -5 is a closed loop pole?

a) Yes b) No

19) When k = 0.795 two poles of the closed loop system are purely imaginary. In order for the system to remain stable

a) $0 < k < 0.795$ b) $k > 0.795$ c) $k > 0$ d) $k < 0$

Problems 20-22 refer to the following system



The closed loop poles of the system are at $-2.91 \pm 11.1j$ and -15.2

20) The best estimate of the **settling time** is

a) $\frac{4}{1}$ seconds b) $\frac{4}{20}$ seconds c) $\frac{4}{15.2}$ seconds d) $\frac{4}{2.91}$ seconds

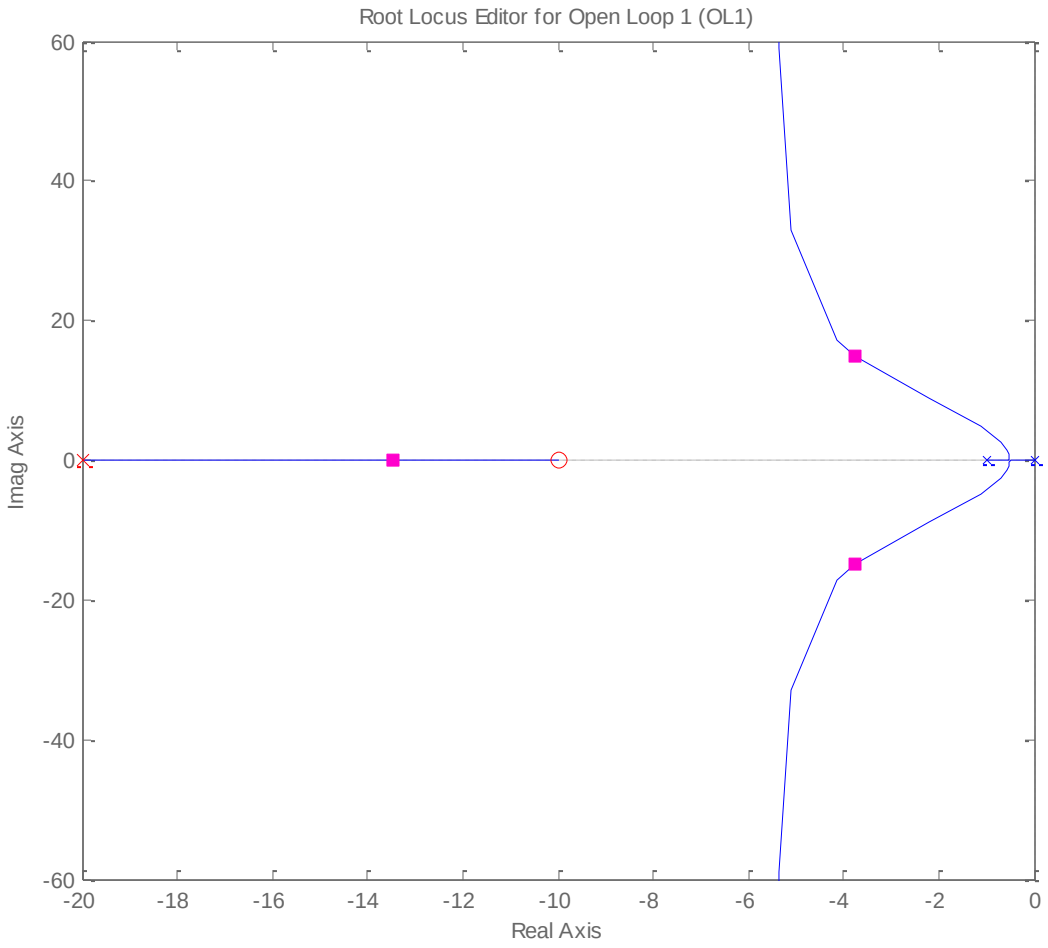
21) The best estimate of the **steady state error** for a **unit step** input is

a) $\frac{1}{101}$ b) $\frac{1}{100}$ c) 0 d) ∞

22) The best estimate of the **steady state error** for a **unit ramp** input is

a) 0 b) ∞ c) $\frac{1}{100}$ d) $\frac{1}{101}$

Problems 23-25 refer to the following root locus plot for a unity feedback system with a plant and a controller.



23) Based on this root locus plot, the best estimate of the poles of the closed loop system are

a) 0, -2, and -20 b) -4+18j, -4-18j, -14

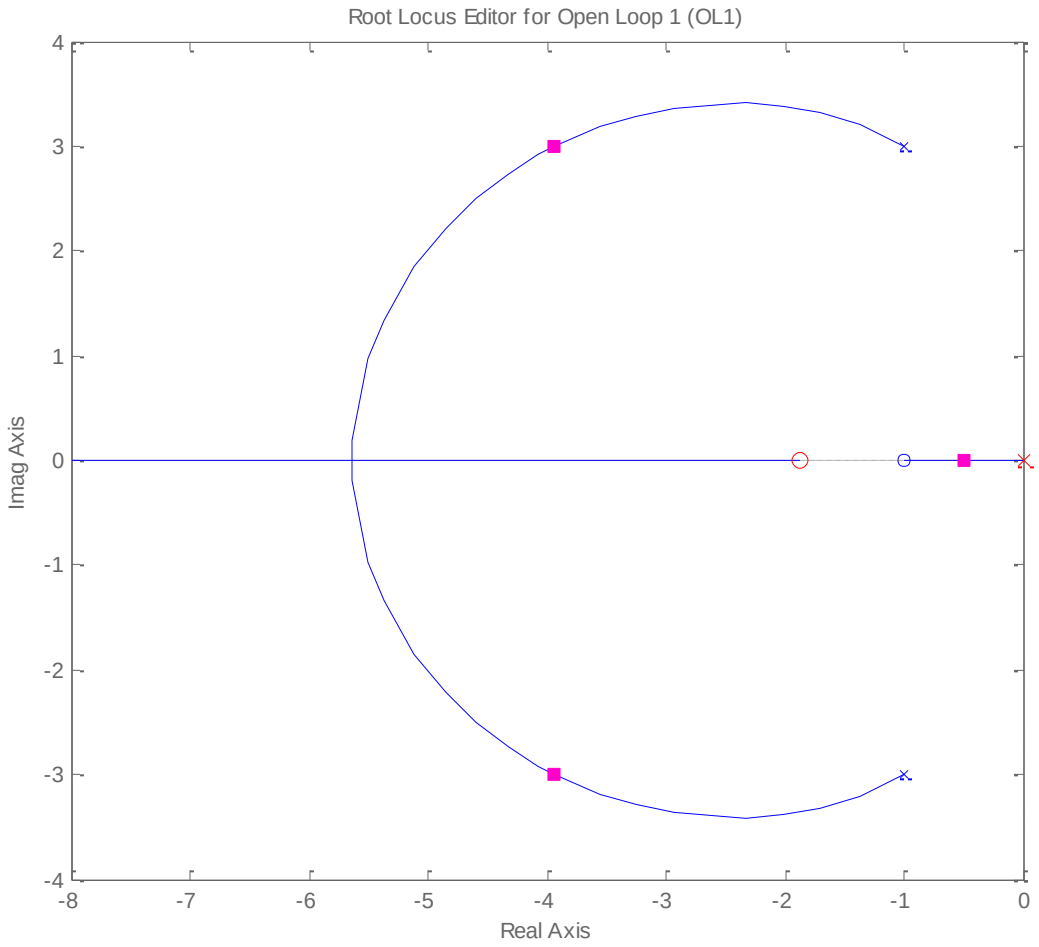
24) Is this a type one system?

a) yes b) no

25) Is this a stable system?

a) yes b) no

Problems 26-28 refer to the following root locus plot for a unity feedback system with a plant and a controller.



26) Based on this root locus plot, the best estimate of the poles of the closed loop system are

a) -1+j3, -1-3j b) -4+3j, -4-3j, -0.5

27) Is this a type one system?

a) yes b) no

28) Is this a stable system?

a) yes b) no

Answers: 1-b, 2-b, 3-a, 4-a, 5-c, 6-c, 7-a, 8-b, 9-b, 10-b, 11-c, 12-c, 13-b, 14-a, 15-b, 16-b, 17-a, 18-a, 19-b, 20-d, 21-c, 22-c, 23-b, 24-a, 25-a, 26-b, 27-a, 28-a