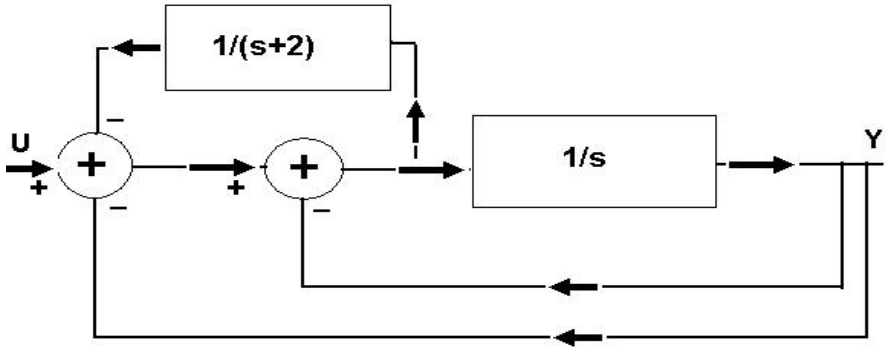
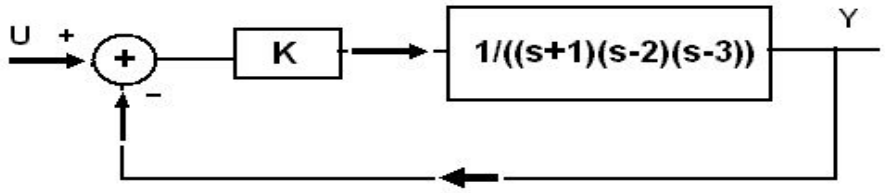
Eskişehir Osmangazi University - Electrical Engineering Department
Fundamentals of Control Systems
Final Examination - Spring 2007

1. A linear time invariant system is described by the block diagram in Figure 1. Compute the overall transfer function $\frac{Y(s)}{U(s)}$.



2. Let $p(s) = 3s^7 + s^6 + 3s^5 + 3s^4 + s^3 + 2s^2 + 3s + 4$. How many roots of p are in the left half complex plane. Show your work.

3. As K varies from zero to infinity, sketch the root locus of the closed loop system whose block diagram is given by Figure 2.



Good Luck,
A. Karamancıoğlu

Solutions

1.

$$\frac{Y(s)}{U(s)} = \frac{\frac{1}{s}}{1 + \frac{1}{s} + \frac{1}{s} + \frac{1}{s+2}} = \frac{s+2}{s^2 + 5s + 4}$$

2.

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[      3,      3,      1,      3]
[      1,      3,      2,      4]
[     -6,     -5,     -9,      0]
[   13/6,    1/2,      4,      0]
[ -47/13,  27/13,      0,      0]
[  82/47,      4,      0,      0]
[ 425/41,      0,      0,      0]
[      4,      0,      0,      0]
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Four sign changes; therefore, four in the RHCP and three in the LHCP.

3.