Name:
ID. No.

Eskişehir Osmangazi University - Electrical Engineering Department
Fundamentals of Control Systems
Final Examination - Summer 2015

All answers must be written in the appropriate neighborhoods of the questions. Anything written elsewhere will not be graded. Use the back side of the exam sheet if you need scratch paper.

Question 1.

For the state space model $\dot{x} = Ax + Bu$, $y = Cx + Du$ of the configuration on the right, write A, B, C, and D.

Answer $A = \begin{bmatrix} 4 & 2 \\ 3 & 5 \end{bmatrix}$; $B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$; $C = \begin{bmatrix} 1 & 1 \end{bmatrix}$; $D = 0$
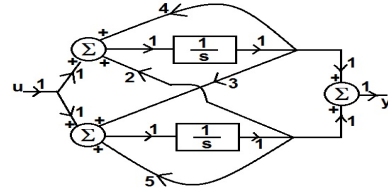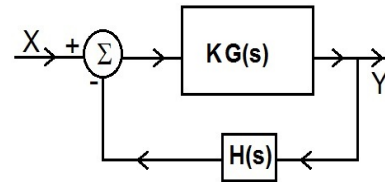

Question 2.

For the configuration on the right $GH = \frac{(s+2)(s+3)}{(s-1+i)(s-1-i)}$ *is given*

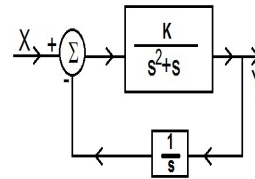*(a) Where do the trajectories of the root locus intersect the imaginary axis?* $\pm\ 1.77i$

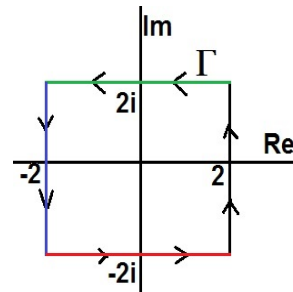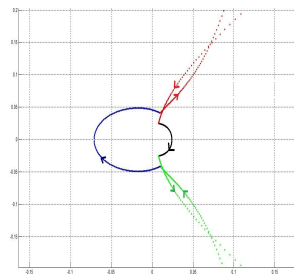*(b) For which values of positive K is the system BIBO stable?* $K > 0.4$

Question 3.

For which values of positive K is the system on the right BIBO stable?

None

Question 4.

Let $f(s) = \frac{s^2+1}{(s^2+3)(s^2+6)(s+1)}$ *and let* Γ *be the counterclockwise oriented boundaries of the square region on the right. Traversing the boundaries* Γ *in the direction of the arrows once, how many times does the image of* $f(s)$ *encircle the origin of the complex plane in the counterclockwise direction.* *Ans. : -1 For this conclusion one does not need to sketch an image graphics, however, 1 included it below for a verification.*

Good Luck
A. Karamancıoğlu