

OKLAHOMA STATE UNIVERSITY
SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING



ECEN 4413/MAE 4053
Automatic Control Systems
Spring 2010



Midterm Exam #1

Choose any four out of five problems.
Please specify which four listed below to be graded:

____; ____; ____; ____;

There is a bonus problem at the end.

Name : _____

E-Mail Address: _____

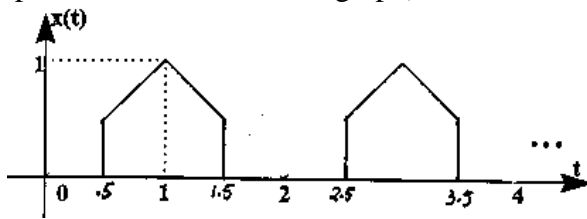
Problem 1:

Find the Inverse Laplace transforms of

$$\int_s^\infty e^{-4\xi} \ln \frac{\xi + a}{\xi + b} d\xi.$$

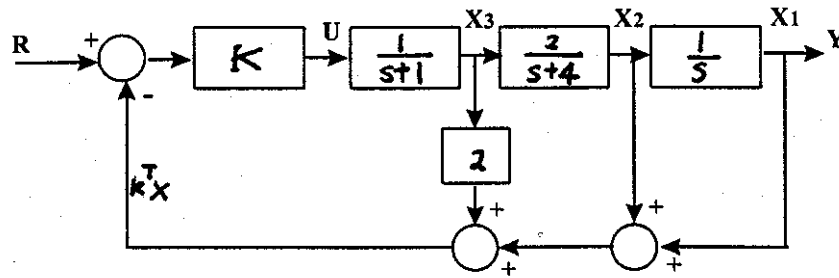
Problem 2:

Determine the Laplace transform of the following signal, $x(t)$, with five periods (only two periods are shown in the graph).

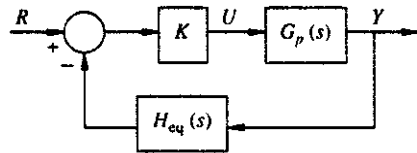


Problem 3:

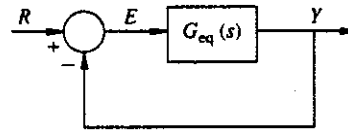
Using *block diagram reduction technique* to rearrange the following block diagram into the equivalent *H* and *G* configurations of the feedback control system shown below.



H Configuration

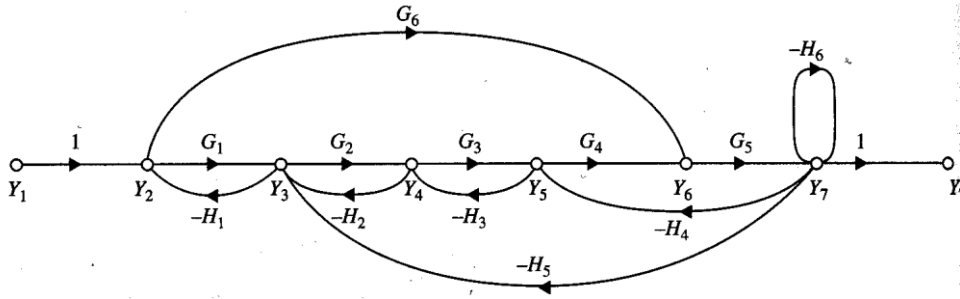


G Configuration



Problem 4:

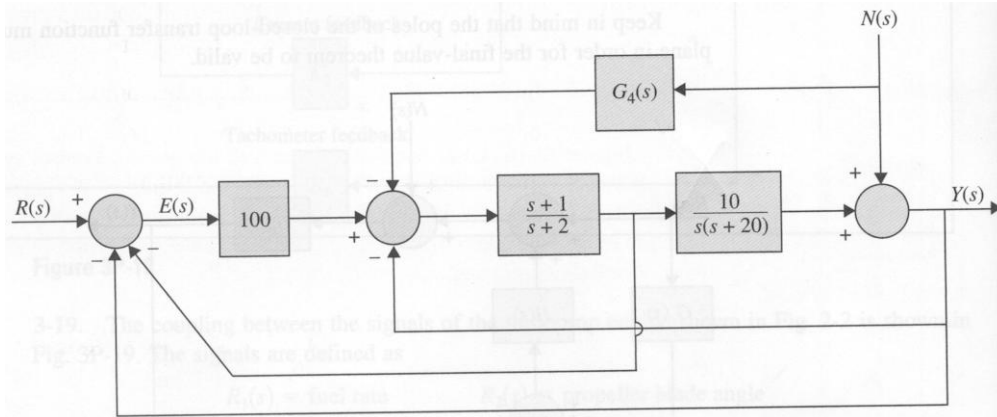
Find the transfer functions Y_8 / Y_1 and Y_2 / Y_1 of the SFG shown below.



Problem 5:

The block diagram of a feedback control system is shown below.

- Derive the transfer functions of $\left. \frac{Y(s)}{R(s)} \right|_{N=0}$, $\left. \frac{Y(s)}{N(s)} \right|_{R=0}$.
- The controller with the transfer function $G_4(s)$ is for the reduction of the effect of the noise $N(s)$. Find $G_4(s)$ so that the output $Y(s)$ is totally independent of $N(s)$.



Bonus Problem (5 points):

What you envision how students will take the exams in the future? Please provide sufficient arguments to justify your points.