Birzeit University-Faculty Of Engineering
Electrical Engineering Department
EE4302-Control Systems I

Inst.: J. Siam **Sample Questions** **1st semester 2015/16**

A. Consider the unity feedback with open loop transfer function

$$G(s) = \frac{(s+6)}{(s^2+s+36)}$$

Design a passive compensator to improve the steady state error of the system by 25% and plot the compensator pole zero map and circuit.

B. Consider the open loop transfer function G of a unity negative-feedback system and its root locus in the following figure, and .

$$G(s) = \frac{20\mathrm{K}}{(s+25)(s^2+10s+75)} \qquad \mathrm{K} > 0$$

1. Design a compensator that improves the steady state error by **at least** 40% without changing significantly the selected set of system poles
2. Implement the desired compensator and determine the values of its elements in the practical range :
   Capacitor :10 pF- 200μF ,Inductor : 10μH-100mH, Resistors : 10Ω-50M

C. Given a unity feedback system with the following open loop transfer function:

1. Plot the root locus of the system for K >0 and determine the values of K for which the system is stable.
2. Design a compensator/controller that achieves the following condition relative to the open loop system parameters:
   Damped oscillation frequency= **15%** lower than the open loop parameter. settling time = **30%** lower than the open loop parameter.

$$G(s) = \frac{K}{(s^2+4s+8)(s+15)}$$