

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

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Sample Questions

1<sup>st</sup> 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 .

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

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.

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