EE 2101: Quiz 2

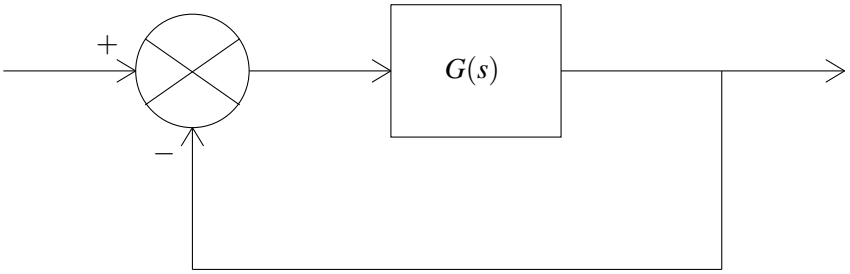

Figure 1: Control System

1. Consider an LTI system shown in Figure 1 with **Marks: 2**

$$G(s) = \frac{50}{s(s+1)(s+4)^2}$$

Let $u(t)$ indicate the unit-step signal. Find the steady-state error corresponding to the following inputs:

(a) $10u(t)$ (b) $10tu(t)$ (c) $10t^2u(t)$

2. Consider an LTI system shown in Figure 1 with **Marks: 4**

$$G(s) = \frac{K}{(s+2)(s+5)^2}$$

(a) Draw the root locus of this system. Mark all important parameters discussed in the class.

(b) Find gain K at which the peak time of the unit step response of this system is $\frac{\pi}{2}$ sec.

3. Consider an uncompensated system shown in Figure 1, that is operating at 30% overshoot and has

$$G(s) = \frac{K}{(s^2+6s+13)(s+15)}$$

The compensated system is required to have the following specifications in the unit step response:

(a) 30% overshoot and (b) half the setlling time as that of the uncompensated system

Design a cascade compensator with a zero at $s=-7$ to achieve these specifications. **Marks: 5**

4. Consider an uncompensated system shown in Figure 1 with **Marks: 4**

$$G(s) = \frac{K}{(s+4)(s+6)(s+10)}$$

Design a compensator of order 1 such that the compensated system has the following specifications in the unit step response:

(a) 25% overshoot and

(b) settling time 2 seconds and

(c) zero steady state error

All the Best!