EE 2101: Quiz 3

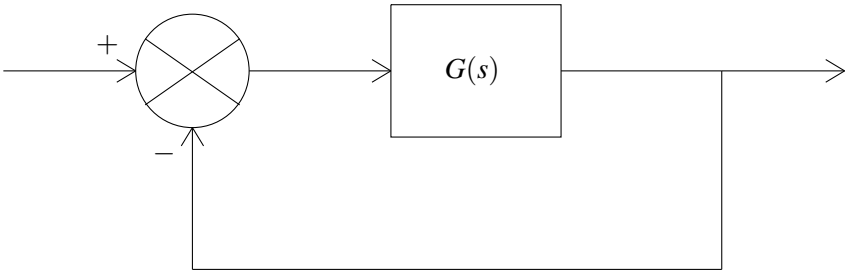

Figure 1: Control System

1. Consider the system with the transfer function **Marks: 3**

$$T(s) = \frac{50(s+1)}{(s+5)(s^2+s+7)}$$

A sinusoidal signal $5sin\big(10t+70^\circ\big)$ is applied to this system. Find the steady-state output of the system.

2. Consider the control system shown in Figure 1 with **Marks: 3**

$$G(s) = \frac{100}{(s+1)(s+3)(s+4)}$$

Find the gain margin and the phase margin of this system.

3. Draw the asymptotic Bode plot of **Marks: 4**

$$G(s) = \frac{s+5}{(s+1)(s^2+4s+49)}$$

Based on this plot, mention the magnitude (dB) and the phase angle (degrees) in the tabular form, for $w = 2$ rad/s, $w = 6$ rad/s and $w = 10$ rad/s.

4. Consider the control system shown in Figure 1 with **Marks: 5**

$$G(s) = \frac{K}{\big(s+5\big)\big(s+6\big)\big(s^2+14s+2549\big)}$$

Consider the circle in the complex plane, denoted by C, whose center is at $s_1 = \big(-5.5+0j\big)$ and whose radius is 0.75. Find the non-negative range of K for which at least one closed-loop pole of the above system is inside circle C.