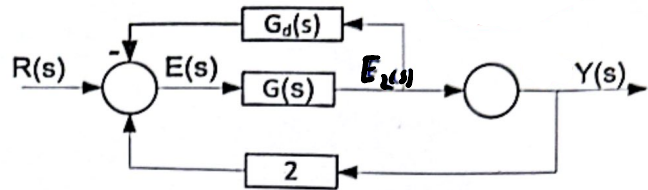


Princess Sumaya University for Technology	 جامعة سميرة Princess Sumaya University for Technology للتكنولوجيا	جامعة الأميرة سميرة للتكنولوجيا
Automatic Control	Student Name:	
Quiz 1	Student ID No.:	
Date: Summer 07/01/2026	Grade:	

Q1) Figure 1 shows the block diagram of a DC-motor control system.

- (a) Find the transfer function $\frac{Y(s)}{R(s)}$
(5 points)



$$E(s) = 2Y(s) + R(s) - E_2(s) \quad \text{--- (1)}$$

$$E_2(s) = E(s) G(s) \quad \text{--- (2)}$$

also notice that $E_2(s) = Y(s)$

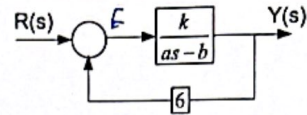
$$E(s) = 2E(s) G(s) + R(s) - E(s) G(s) G_d(s)$$

$$E(s) = \frac{R(s)}{1 + G(s) G_d(s) - 2G(s)}$$

$$\text{so } \frac{Y(s)}{R(s)} = \frac{G(s)}{1 + G(s) G_d(s) - 2G(s)}$$

Q2. Stability

Given that $a=3$ and $b=9$, find the range of the gain k for the closed-loop system stability. (5 points)



$$\frac{\frac{k}{3s-9}}{1 - \frac{6k}{3s-9}} \Rightarrow \frac{k}{3s-9-6k} \Rightarrow \frac{3s}{3} = \frac{9+6k}{3}$$

$$3 + 2k > 0 \Rightarrow 2k > -3 \Rightarrow k < -\frac{3}{2}$$