1. (D-107) Derive an expression for \( H(s) = \frac{V_2(s)}{V_1(s)} \) and draw the Bode plot (magnitude and phase) of \( H(s) \) for \( \tau = \frac{L_1}{R_1} = 1 \mu s \). What is the unity-gain frequency? Assume that the operational amplifier is ideal.

2. A dual shaft motor with 1:80 reduction gearing has a quadrature encoder with 16 magnetic zones attached to its shaft (before the reduction gearing). Calculate the counts per meter displacement detected by a quadrature decoder if the motor drives a robot with 100mm diameter wheels.