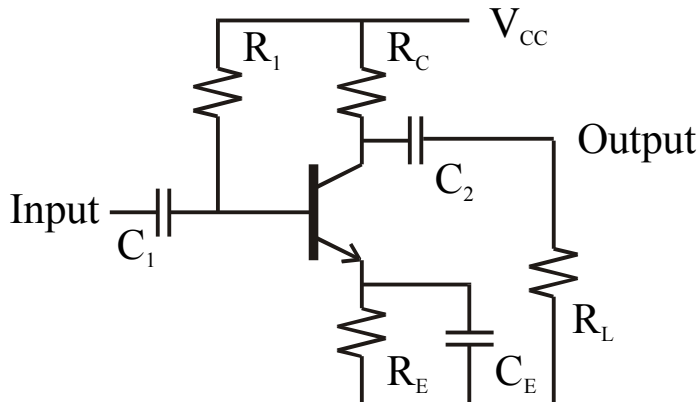


Mark:

EE2109 Electronic Circuits Part B
Tutorial – Determining the frequency response of amplifiers

Name: _____ Student Number: _____ Date : _____

1. Determine the 3dB cutoff frequencies and the mid-frequency gain of the following amplifier. How does the source/load resistance affect the frequency response?



Assumptions

$$\omega_1 < \omega_2 < \omega_b < \omega_a$$

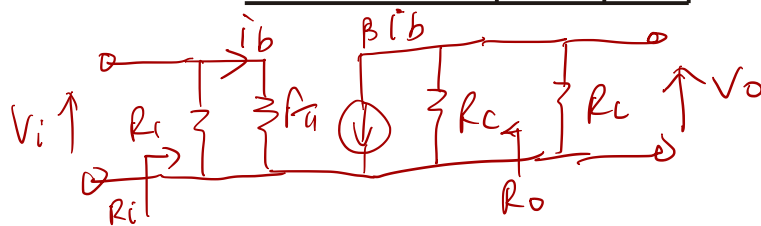
$$\omega_1 = \frac{1}{(R_1 \parallel R_2) C_1}$$

$$\omega_2 = \frac{1}{C_2 (R_C + R_L)}$$

$$\omega_b = \frac{1}{C_E R_E}$$

$$\omega_a = \frac{1}{C_E (R_E \parallel \frac{R_2}{\beta + 1})}$$

$$A_v(\text{mf}) = -\frac{\beta (R_C \parallel R_L)}{r_{\pi}}$$



$$A_v(\text{mf}) = \frac{V_o}{V_i} = -\frac{\beta i_b (R_C \parallel R_L)}{i_b r_{\pi}} = -\frac{\beta (R_C \parallel R_L)}{r_{\pi}}$$

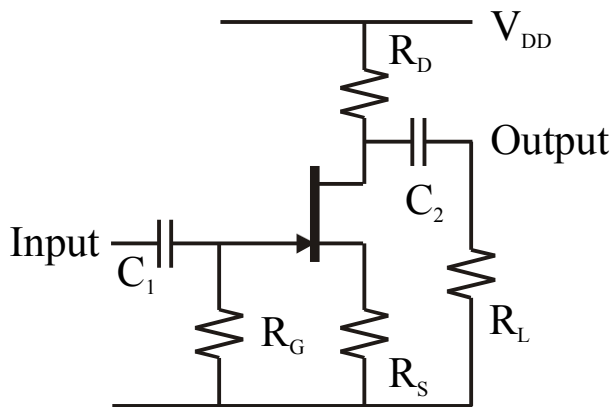
$$\omega_1 = \frac{1}{C_1 R_i} = \frac{1}{(R_1 \parallel R_2) C_1}$$

$$\omega_2 = \frac{1}{C_2 (R_C + R_L)} = \frac{1}{C_2 (R_C + R_L)}$$

$$\omega_b = \frac{1}{C_E R_E}$$

$$\omega_a = \frac{1}{C_E (R_E \parallel \frac{R_2}{\beta + 1})}$$

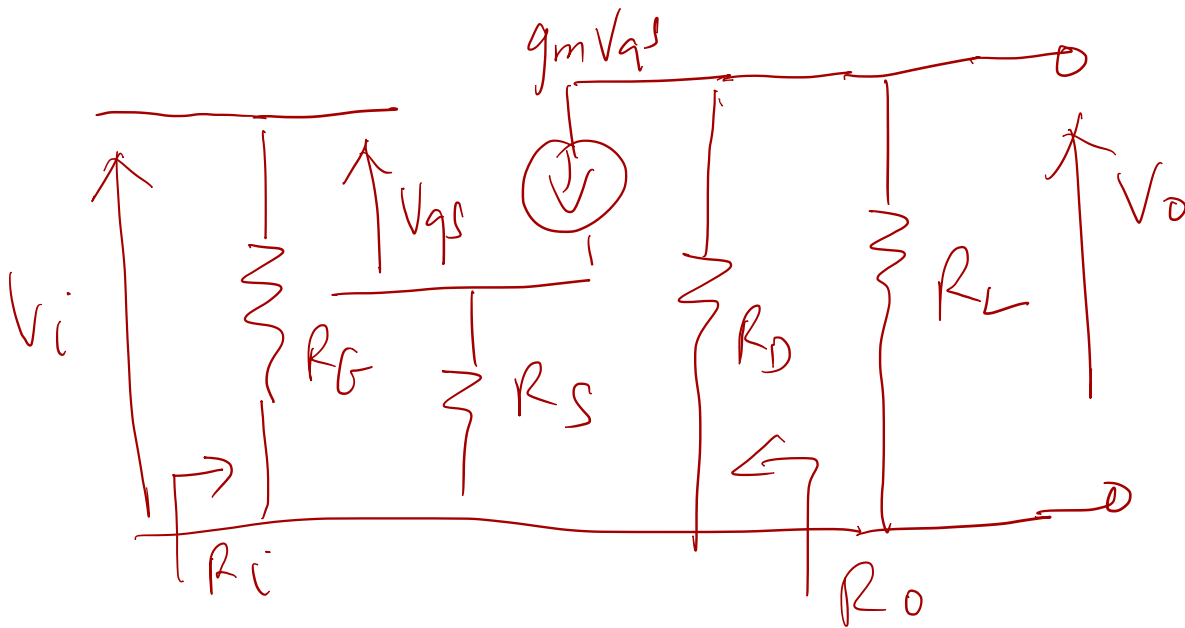
2. Determine the 3dB cutoff frequencies and the mid-frequency gain of the following amplifier. How does the source/load resistance affect the frequency response?



$$\omega_1 = \frac{1}{C_1 R_G}$$

$$\omega_2 = \frac{1}{C_2 (R_D + R_L)}$$

$$A_v(\text{mf}) = \frac{-g_m (R_D \parallel R_L)}{1 + g_m R_S} \approx \frac{-R_D \parallel R_L}{R_S}$$



$$\begin{aligned}
 A_v(\text{mf}) &= \frac{V_o}{V_i} = \frac{-g_m V_{gs} (R_D \parallel R_L)}{(V_{gs} + g_m V_{gs} R_S)} \\
 &= \frac{-g_m (R_D \parallel R_L)}{1 + g_m R_S} \approx -\frac{R_D \parallel R_L}{R_S}
 \end{aligned}$$

$$W_1 = \frac{1}{C_1 R_i} = \frac{1}{C_1 R_G}$$

$$W_2 = \frac{1}{C_2 (R_D + R_L)} = \frac{1}{C_2 (R_D + R_L)}$$