

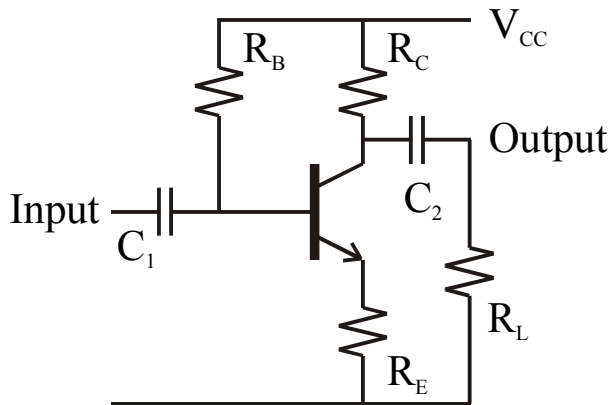
Mark:

EE3110 Electronic Circuits

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?

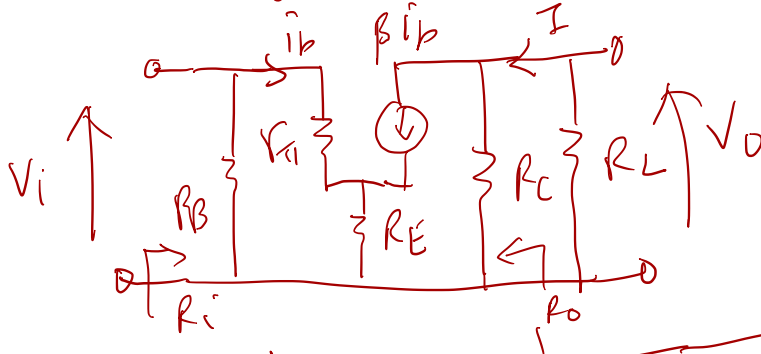


$$\omega_1 = \frac{1}{C_1 (R_B \parallel (R_{\pi} + (\beta + 1) R_E))}$$

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

$$A_v(\text{mf}) = - \frac{R_C \parallel R_L}{R_E}$$

At mid freq $C_1, C_2 \rightarrow 0$



$$A_v(\text{mf}) = \frac{V_o}{V_i} = \frac{-\beta i_b R_C \parallel R_L}{i_b (R_{\pi} + (\beta + 1) R_E)}$$

$$= - \frac{\beta (R_C \parallel R_L)}{R_{\pi} + (\beta + 1) R_E}$$

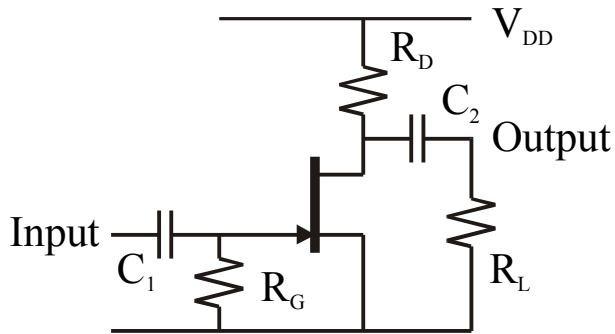
$$\approx - \frac{R_C \parallel R_L}{R_E}$$

$$\omega_1 = \frac{1}{C_1 R_i} = \frac{1}{C_1 (R_B \parallel (R_{\pi} + (\beta + 1) R_E))}$$

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

$$\therefore R_o = \frac{V_o}{I} \Big|_{V_i = 0} = R_D$$

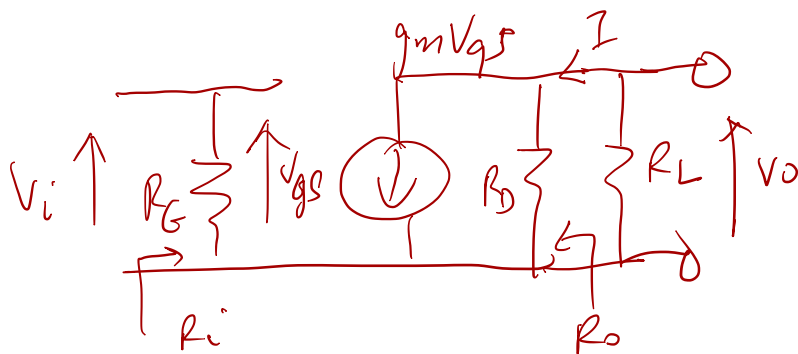
2. Determine the 3dB cutoff frequencies and the mid-frequency gain of the following amplifier. How does the source/load resistance affect the frequency response?



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

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

$$A_v(\text{mf}) = -g_m (R_D \parallel R_L)$$



$$A_v(\text{mf}) = \frac{V_o}{V_i}$$

$$= \frac{-g_m V_{gs} (R_D \parallel R_L)}{V_{gs}}$$

$$= -g_m (R_D \parallel R_L)$$

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

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

$$\therefore R_D = \frac{V_o}{I} \bigg|_{V_i = 0}$$

$$= R_D$$