

Mark:

EE3110 Electronic Circuits
Analysis of Different Topologies of Feedback amplifier

Name: _____ Student Number: _____ Date : _____

1. Figure 1(b) is the small signal equivalent circuit of an amplifier shown in Figure 1(a) using simplified hybrid pi model.

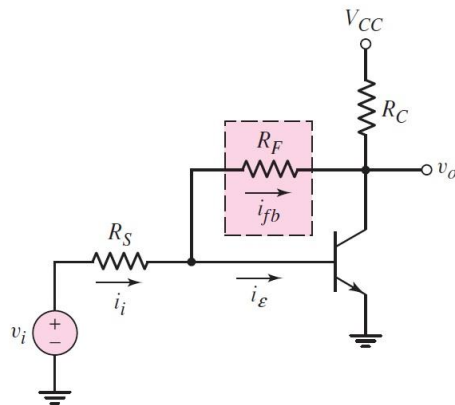


Figure 1(a)

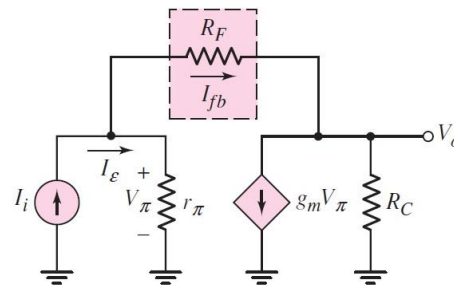
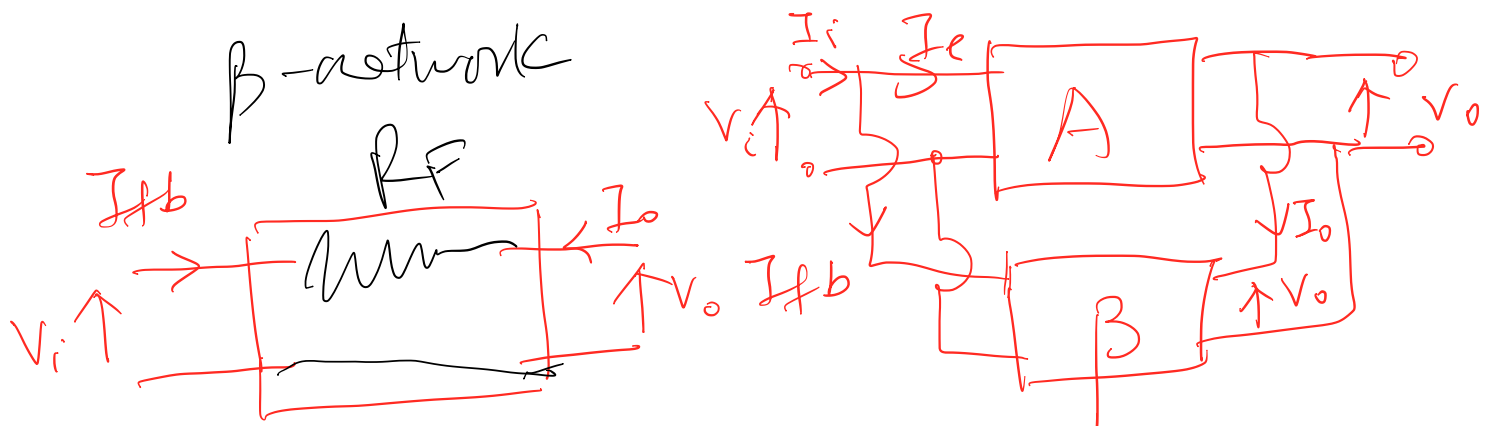


Figure 1(b)

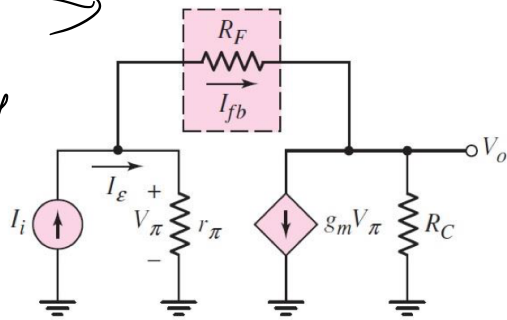
- a) Identify both ac and dc feedback network. What is kind of feedback topologic in figure 1? Hence determine the signal type of the input and output of the amplifier.

Both ac and dc feedback network R_F resistor. It is a shunt shunt topology. So the input is current and the output is voltage.

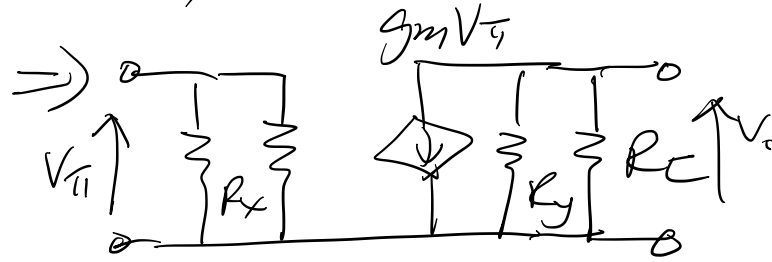
- b) Sketch the non-ideal feedback network equivalent circuit. Then define and determine the parameters R_x , R_y and β in terms of the feedback network resistors. You may assume $g_m R_C \gg 1$ and $R_F \gg R_C$ & r_π



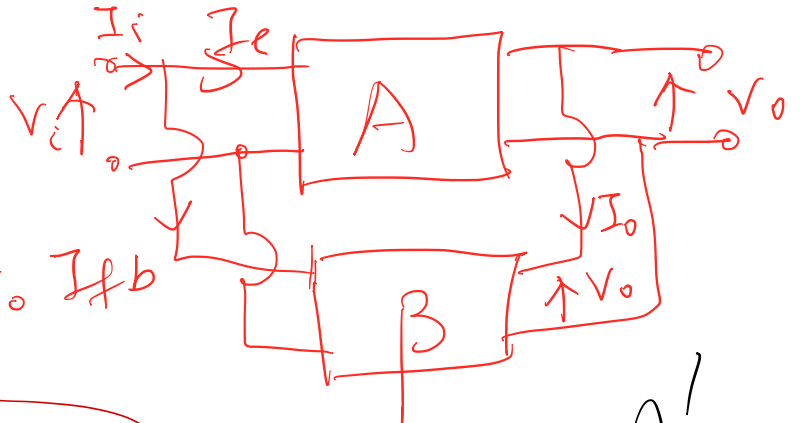
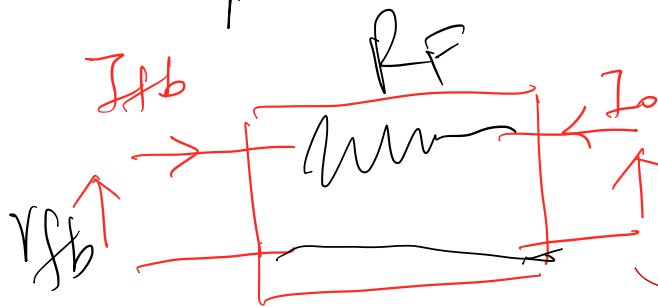
removing the feedback
but
preserving
the
effect
of the
 R_F



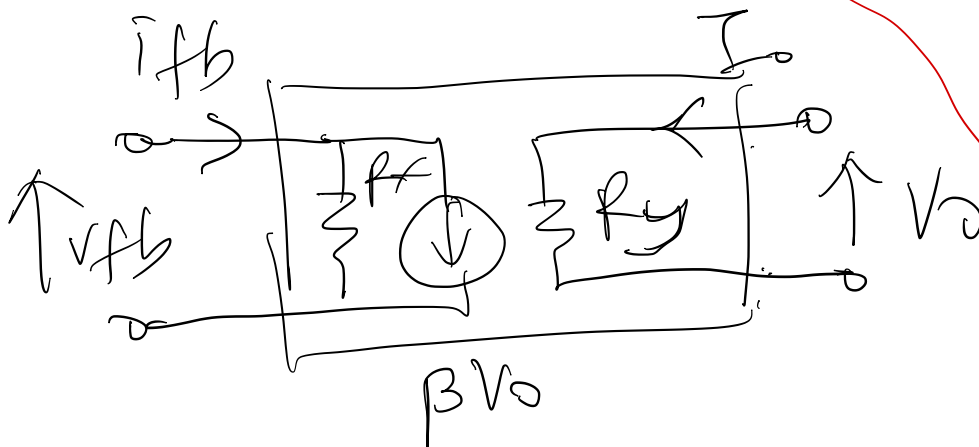
$$A_v, R_i, R_o \Rightarrow A_{vf}, R_{if}, R_{of}$$



β -network



$$A_{vf} = \frac{A'}{1 + \beta A_v}$$



$$R_x = \frac{V_{fb}}{i_{fb}} \Big|_{V_o = 0}$$

$$R_x = \frac{V_{fb}}{i_{fb}} \Big|_{V_o = 0} \approx R_F$$

$$R_y = \frac{V_o}{I} \Big|_{V_{fb} = 0}$$

$$R_y = \frac{V_o}{I} \Big|_{V_{fb} = 0} \approx R_F$$

$$\beta = \frac{i_{fb}}{V_o} \Big|_{V_{fb} = 0} = -\frac{1}{R_F}$$

2. Figure 2 is the small signal equivalent circuit of an amplifier using simplified hybrid pi model.

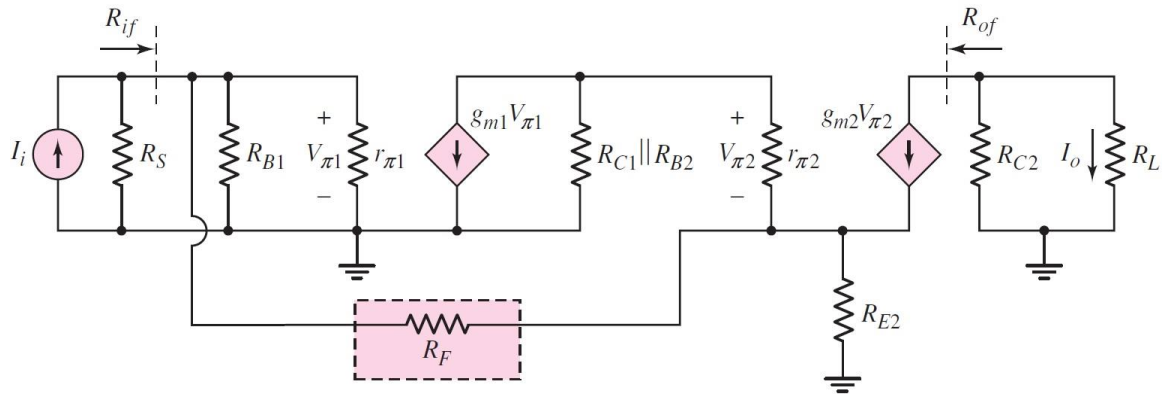
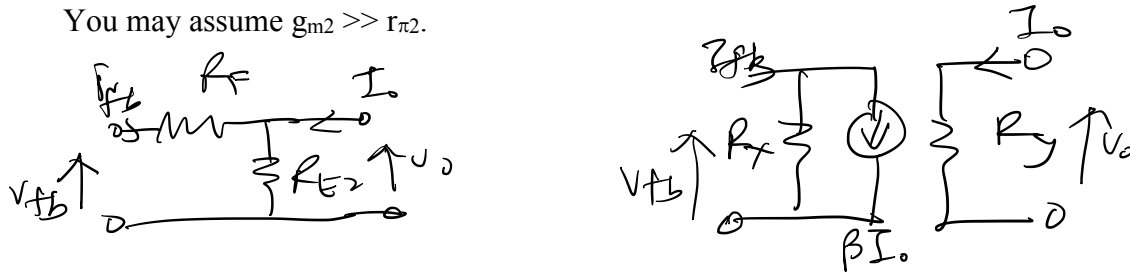


Figure 2

- a) Identify feedback network. What is kind of feedback topologic in figure 2? Hence determine the signal type of the input and output of the amplifier.

The feedback network involved R_F resistor. It is a shunt-series topology. So input signal is current while output signal is also current.

- b) Sketch the non-ideal feedback network equivalent circuit. Then define and determine the parameters R_x , R_y and β in terms of the feedback network resistors. You may assume $g_{m2} \gg r_{\pi2}$.



$$R_x = \frac{v_{AB}}{i_{AB}} \bigg|_{I_o = 0} \quad R_y = \frac{V_o}{I_o} \bigg|_{v_{AB} = 0} \quad \beta = \frac{I_{AB}}{I_o} \bigg|_{v_{AB} = \infty}$$

$$R_x = R_F + R_{E2} \quad R_y = R_F \parallel R_{E2}$$

$$\beta = - \frac{R_{E2}}{R_F + R_{E2}}$$