Microelectronics Circuit Analysis and Design
Homework(14th)

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Nov 12nd, 2023

Analysis circuit, determine the voltage gain:

1.

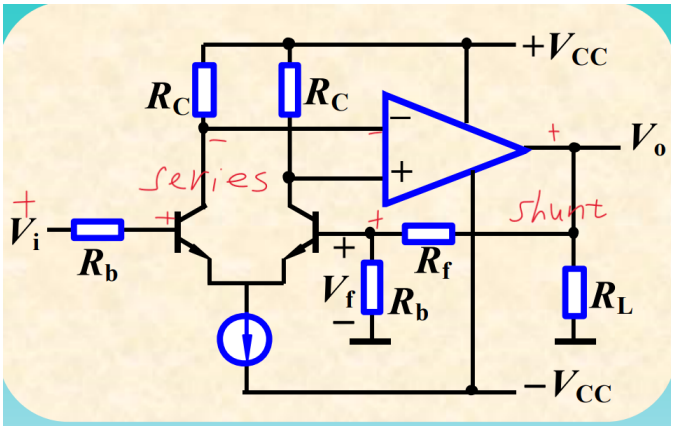

Figure 1: Problem 1

Solution:

It's a Series-Shunt-Negative Feedback Circuit. The voltage gain is as follow:

$$A_{vf} = \frac{V_o}{V_i} = \frac{V_o}{V_f} = \frac{V_o}{\frac{R_b}{R_f + R_b} V_o} = 1 + \frac{R_f}{R_b}$$

2.

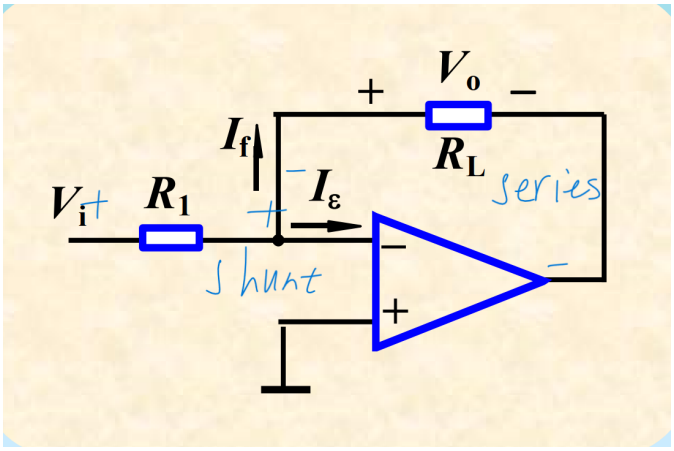

Figure 2: Problem 2

Solution:

It's a Shunt-Shunt-Negative Feedback Circuit. The gain is as follow:

$$A_{rf} = \frac{V_o}{I_i} = \frac{V_o}{I_f} = R_L \Rightarrow A_{vs} = \frac{V_o}{V_i} = \frac{V_o}{I_i R_1} = \frac{R_L}{R_1}$$

3.

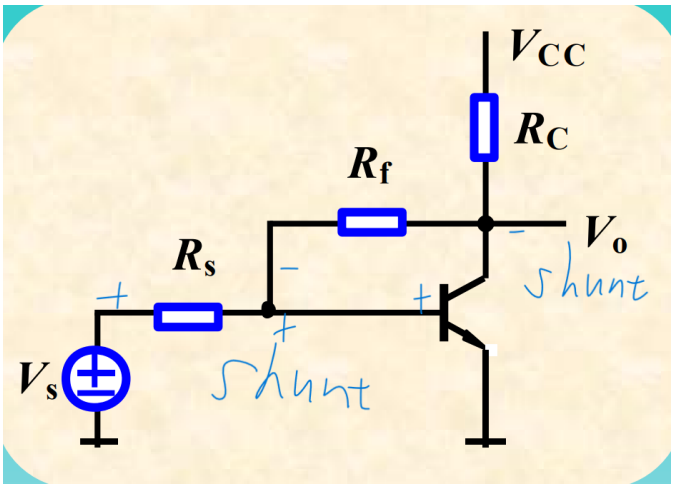

Figure 3: Problem 3

Solution:

It's a Shunt-Shunt-Negative Feedback Circuit. The gain is as follow:

$$A_{rf} = \frac{V_o}{I_i} = \frac{V_o}{I_f} = -R_f \Rightarrow A_{vs} = \frac{V_o}{V_i} = \frac{V_o}{I_i R_s} = -\frac{R_f}{R_s}$$

4.

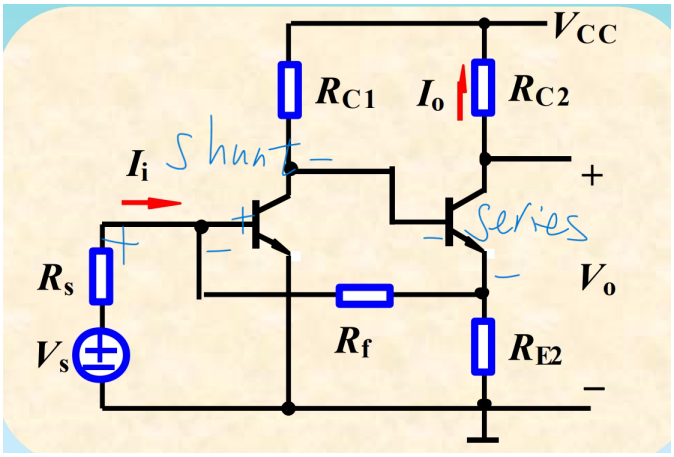

Figure 4: Problem 4

Solution:

It's a Shunt-Series-Negative Feedback Circuit. The gain is as follow:

$$A_{if} = \frac{I_o}{I_i} = \frac{I_o}{\frac{R_{E2}}{R_{E2}+R_f} I_o} = 1 + \frac{R_f}{R_{E2}} \Rightarrow A_{vs} = \frac{V_o}{V_i} = \frac{I_o R_{C2}}{I_i R_s} = \frac{R_{C2}}{R_s}(1 + \frac{R_f}{R_{E2}})$$

5. Design feedback network determine its parameter, and connect it with basic amp. Assume that closed-loop is

$$A_{vf} = \frac{V_o}{V_i} = -47$$

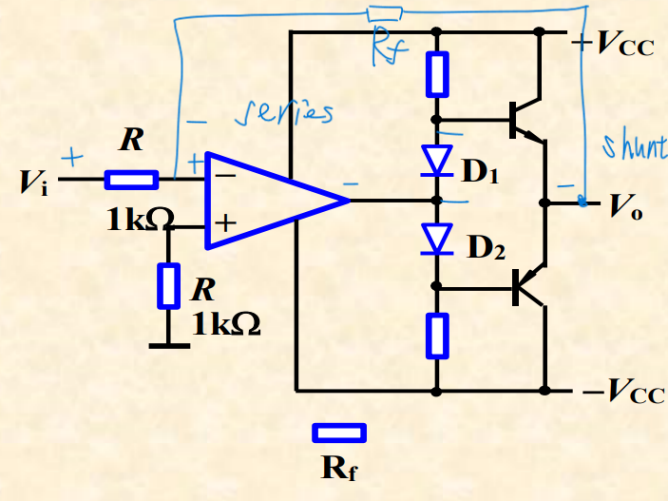

Figure 5: Problem 5

Solution:

The designed circuit is in the figure above, It's a Shunt-Shunt-Negative Feedback Circuit. Now we solve the value of resistor R_f.

$$A_{rf} = \frac{V_o}{I_i} = \frac{V_o}{I_f} = -R_f \Rightarrow A_{vf} = \frac{V_o}{V_i} = \frac{V_o}{I_i R} = -\frac{R_f}{R} \Rightarrow R_f = 47\text{k}\Omega$$