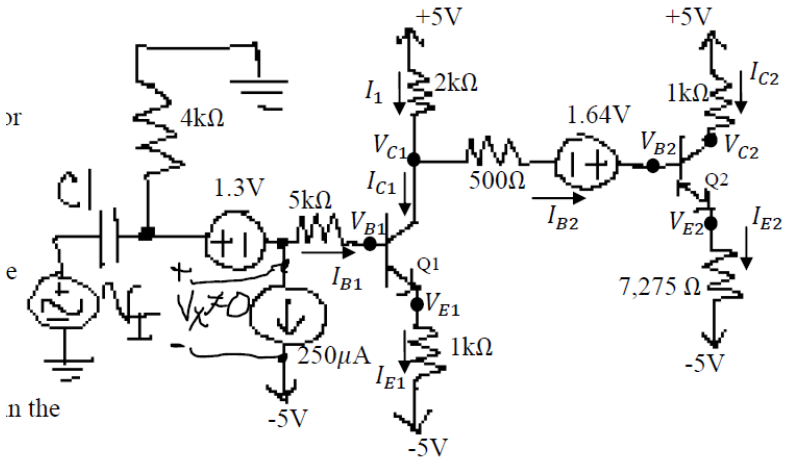
1. Use: ignore r_o, $|V_{BE}|$=0.7, β=100

(a) Assume active mode and solve for the DC values:
   a. $I_{B1}, I_{B2}, I_{E1}, I_{E2}, I_{C1}, I_{C2}$
   b. $V_{B1}, V_{B2}, V_{E1}, V_{E2}, V_{C1}, V_{C2}$

(b) Prove or disprove operation in the active region for both transistors.

(c) What will be the maximum input for V_I if V_{C2}/V_I = -5V/V? (Assume the circuit is operating in the correct frequency range.)

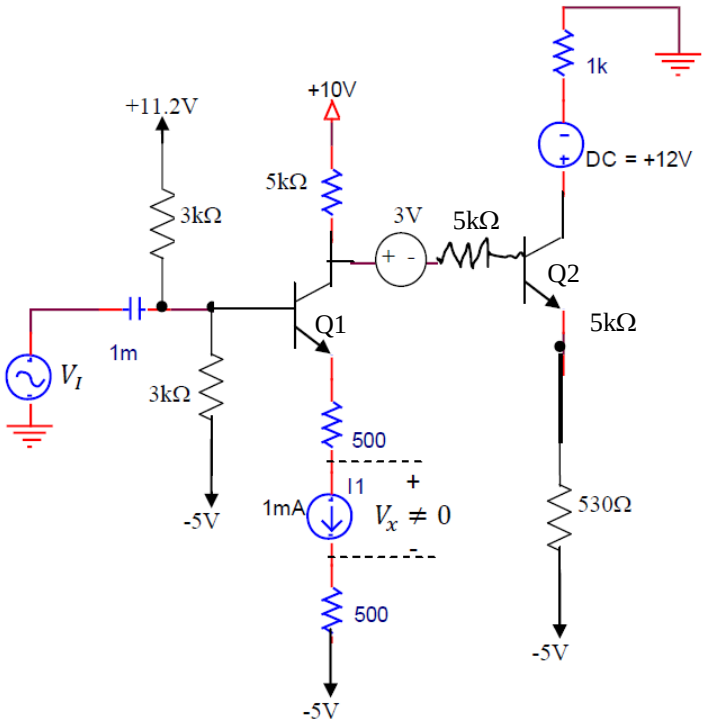


2. Use: ignore r_o, $|V_{BE}|$=0.7, β=100

(a) Assume active mode and solve for the DC values:
   a. $I_{B1}, I_{B2}, I_{E1}, I_{E2}, I_{C1}, I_{C2}$
   b. $V_{B1}, V_{B2}, V_{E1}, V_{E2}, V_{C1}, V_{C2}$

(b) Prove or disprove operation in the active region for both transistors.

(c) What will be the maximum input for V_I if V_{C2}/V_I = -5V/V? (Assume the circuit is operating in the correct frequency range and that the amplification does not pull the transistors out of active region).



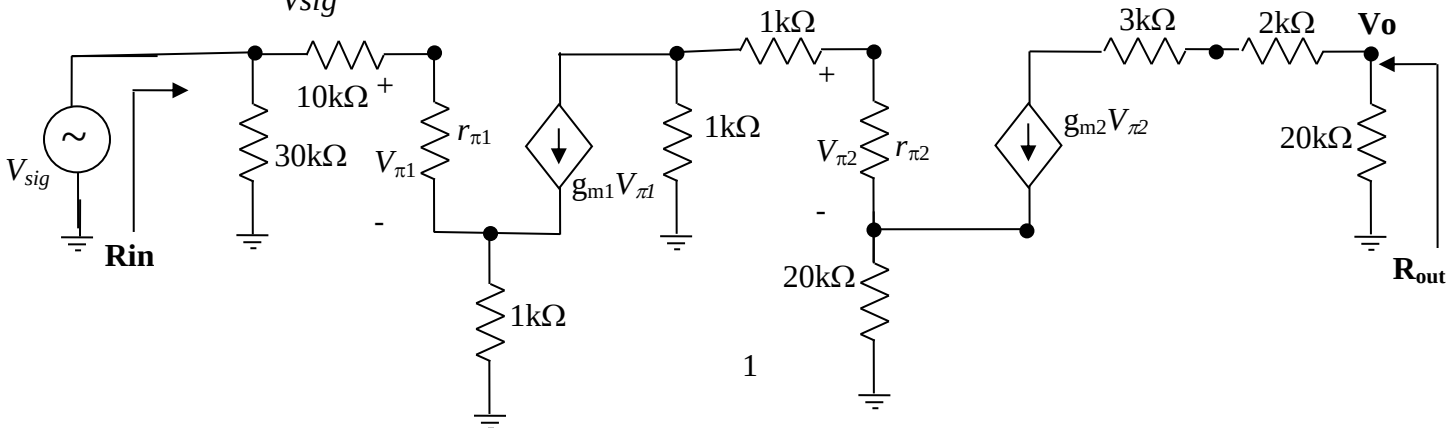
3. Use: ignore r_o, $|V_{BE}|$=0.7, β=100, V_T=25mV
V_{sig} = 10+0.002sin(20t)
$r_{\pi 1}$=4,000 and g_{m2}=10mA/V

For the following hybrid-π equivalent circuit below, find the following values:

(a) R_{in} (input resistance –ignore only the input source, Vsig and include all resistors at the base)

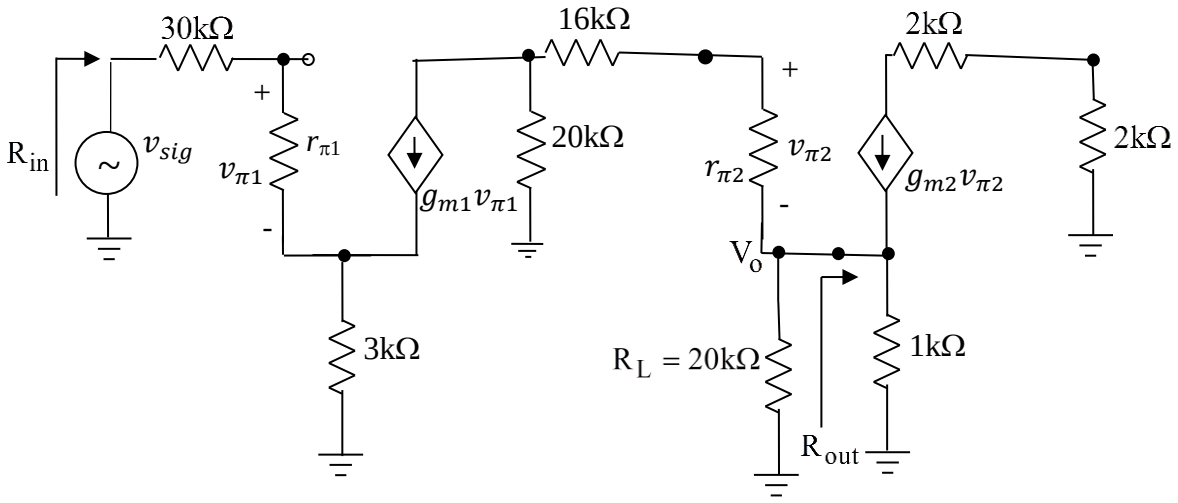
(b) R_{out} (output resistance-include **all** resistors {no load is connected})

(c) midband gain, $\frac{Vo}{Vsig}$

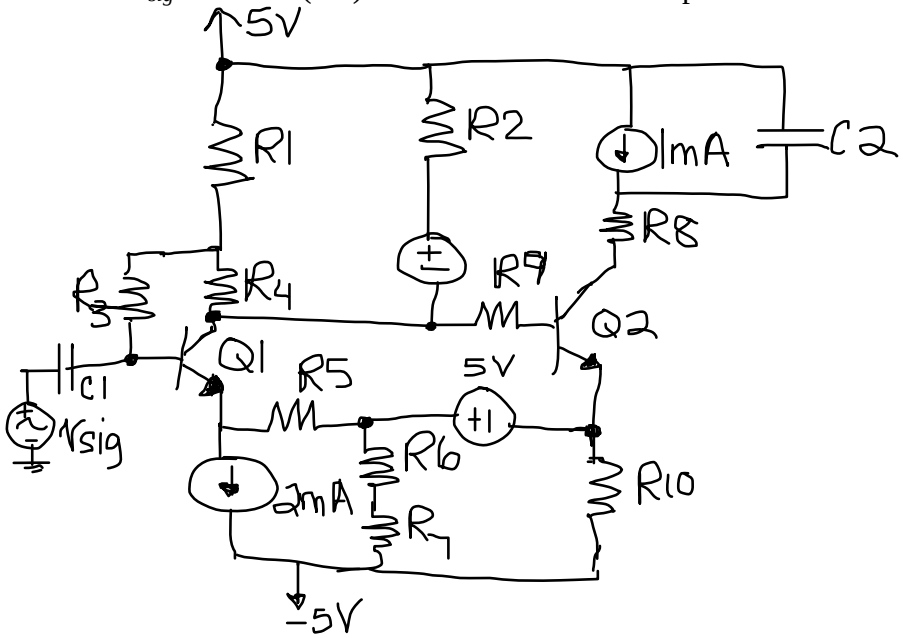


4. Use: **ignore r_o, $|V_{BE}|$=0.7, β=100, V_T=25mV**
V_{sig} = 10+0.002sin(20t)
$r_{\pi 1}$=4,000 and g_{m2}=10mA/V

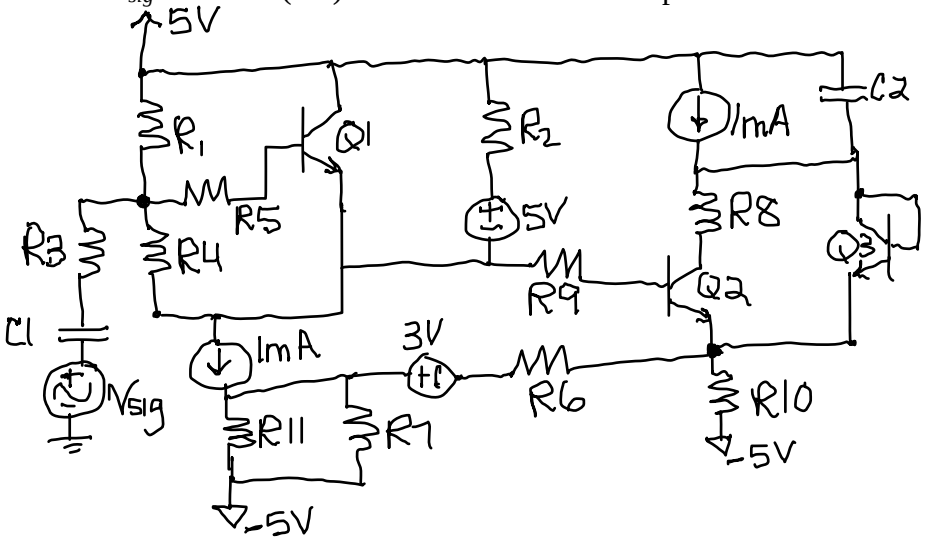
For the following hybrid-π equivalent circuit below, find the following values:
(a) R_{in} (input resistance –ignore only the input source, Vsig and include all resistors)
(b) R_{out} (output resistance-ignore R_L)
(c) midband gain, $\frac{Vo}{Vsig}$



5. For the circuit shown below, **draw** the AC small-signal equivalent circuit(use hybrid-π or model T). Make sure that everything is labeled in terms of the transistor number. (e.g. g_{m1}, $v_{\pi 2}$, etc.). **Include r_o** for all transistors. v_{sig}=0.001sin(10t) AC. Assume that the capacitors act as a short.

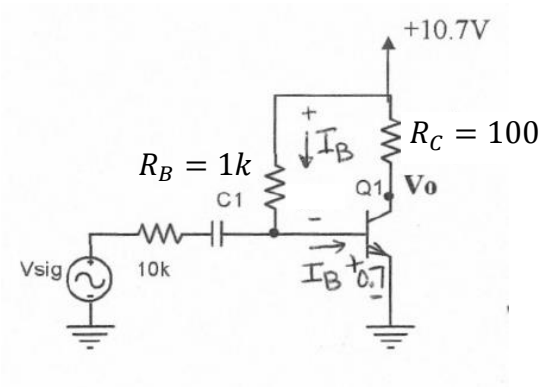


6. For the circuit shown below, **draw** the AC small-signal equivalent circuit(use hybrid-π or model T). Make sure that everything is labeled in terms of the transistor number. (e.g. g_{m1}, $v_{\pi 2}$, etc.). **Include $\mathbf{r_o}$** for all transistors. v_{sig}=0.001sin(10t) AC. Assume that the capacitors act as a short.



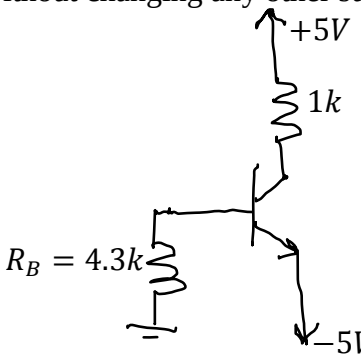
7. $|V_{BE}|$=0.7, β=100, V_T=25mV, $\left|V_{CE_{SAT}}\right|$ =0.2V, ignore r_o, v_{sig} ={2+0.1sin(ωt)}Volts. Assume that the capacitor acts as an open for DC operation and short for AC operation.

(a) Assume transistor is acting in saturation, **solve** for I_B, I_C, and β_{forced}.
(b) Express the condition for R_B, without changing any other supply voltage or resistors, that will move the transistor to the **active region.**



8. $|V_{BE}|$=0.7, β=100, V_T=25mV, $\left|V_{CE_{SAT}}\right|$ =0.2V.

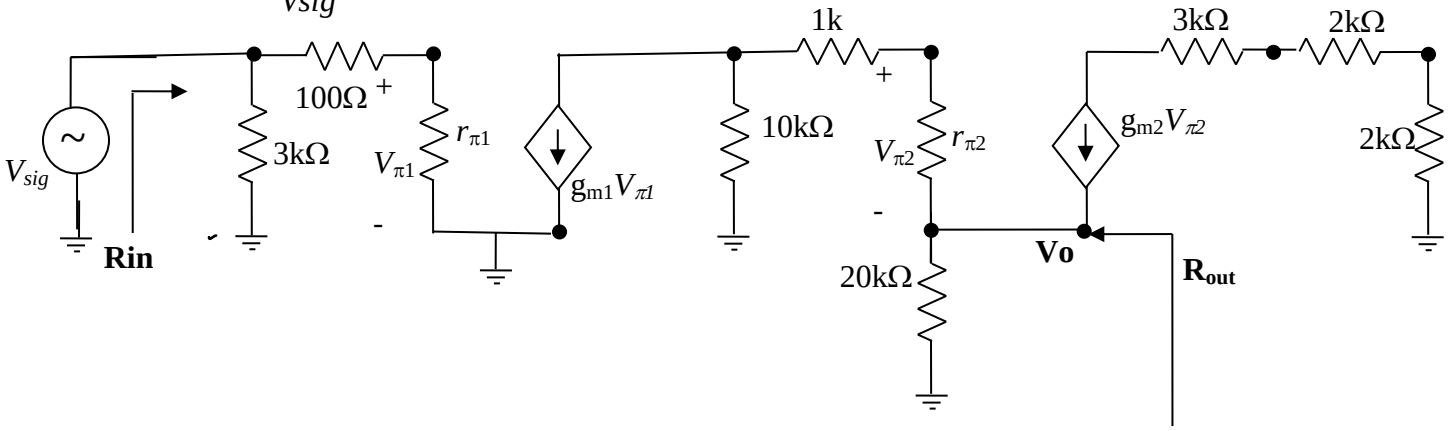
(a) Assume transistor is acting in saturation, **solve** for I_B, I_C, and β_{forced}.
(b) How can R_B be changed so that the transistor moves into the active region? Express the condition for R_B, without changing any other supply voltage or resistors, that will keep the transistor in the **active region.**



9. Use: **ignore r_o, $|V_{BE}|$=0.7, β=100, V_T=25mV**
V_{sig} = 10+0.002sin(20t)

$r_{\pi 1}$=4,000 g_{m2}=100mA/V, and I_{B2}=25μA

For the following hybrid-π equivalent circuit below, find the following values:
(a) R_{in} (input resistance –ignore only the input source, Vsig and include all resistors at the base)
(b) R_{out} (output resistance-include **all** resistors {no load is connected})
(c) midband gain, $\frac{Vo}{Vsig}$



10. ignore r_o, $|V_{BE}|$=0.7, β=100, V_T=25mV
V_{sig} = 10+0.002sin(20t)
$r_{\pi 1}$=4,000 g_{m2}=100mA/V, and I_{B2}=25μA

For the following hybrid-π equivalent circuit below, find the following values:
(a) R_{in} (input resistance –ignore only the input source, Vsig and include all resistors at the base)
(b) R_{out} (output resistance-include **all** resistors {no load is connected})
(c) midband gain, $\frac{Vo}{Vsig}$
(d) Is this a good amplifier? why or why not?