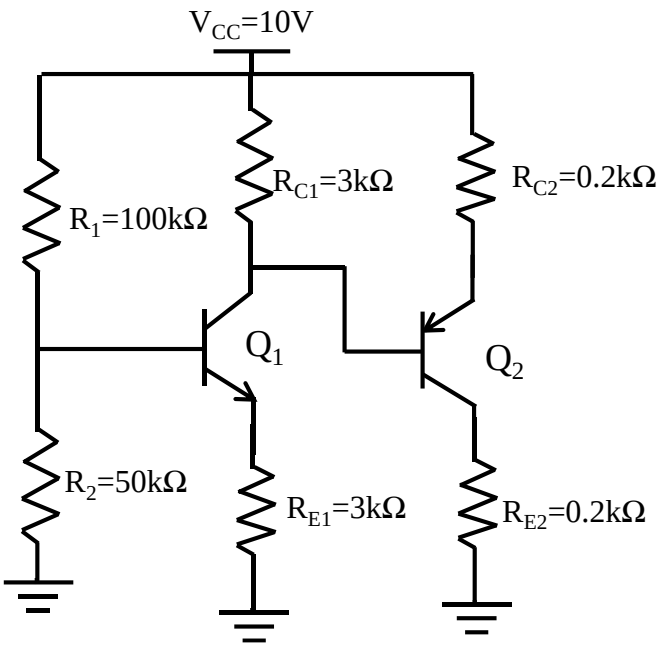
Please submit your solutions to Moodle by Monday, 27.11.2023, 23:55.

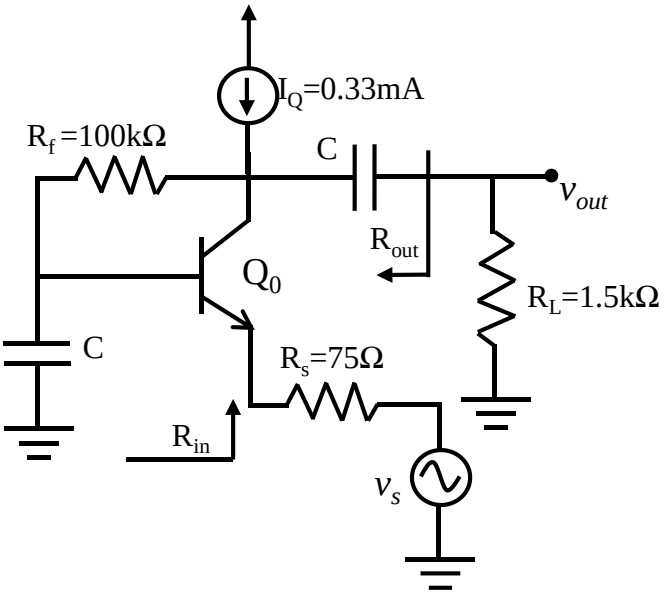
1.



$V_{BE}(ON) = V_{EB}(ON) = 0.7V$
$V_{CE}(SAT) = V_{EC}(SAT) = 0.2V$
$\beta_1 = \beta_2 = 100$

Find the DC operating point of Q_1 and Q_2 and verify the transistor states.

2.



β=100
$V_{BE}(ON)$=0.7V
$V_{CE}(SAT)$=0.2V
V_A=∞

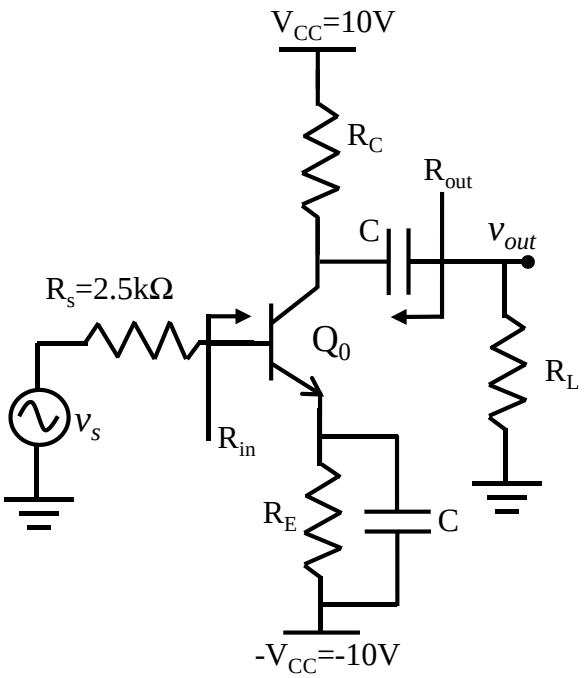
a. Find the Quiescent voltages and currents.

b. Find s.s. AC R_{in} and R_{out}.

c. Find R_{out} if r_o=100kΩ.

d. Find $A_V=v_{out}/v_s$ by assuming $r_o=\infty$.

3.



β=100
$V_{BE}(ON)$=0.7V
$V_{CE}(SAT)$=0.2V
V_A=∞, V_T=26mV

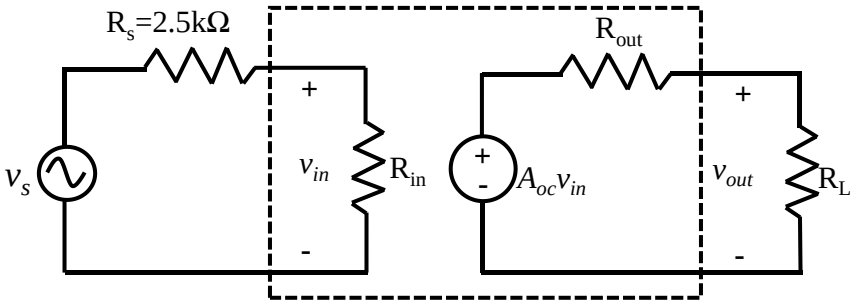
a. Find the value of R_E to establish a DC emitter current of 0.5mA.

b. Find the value of R_C to establish a DC collector voltage of 5V.

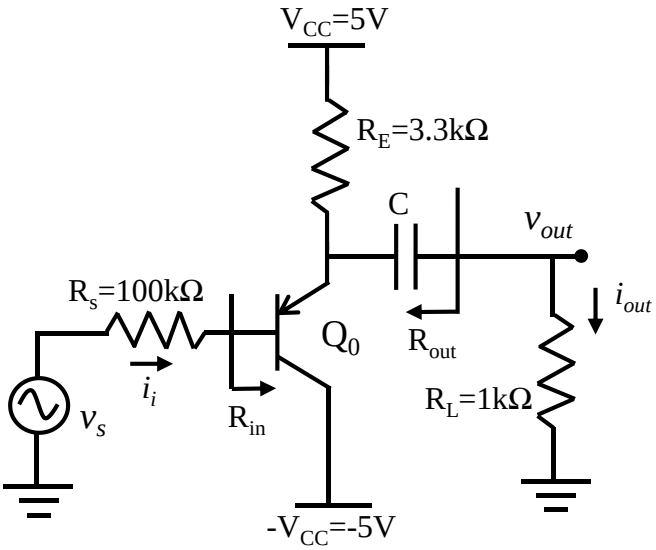
c. For R_L=10kΩ and the transistor r_o=200kΩ draw the small signal equivalent circuit of the amplifier and determine the overall voltage gain.

d. Find s.s. AC R_{in} and R_{out}.

e. Consider the equivalent circuit below, what is A_{OC}?



4.



β=100
$V_{BE}(ON)$=0.7V
$V_{CE}(SAT)$=0.2V
V_A=∞, V_T=26mV

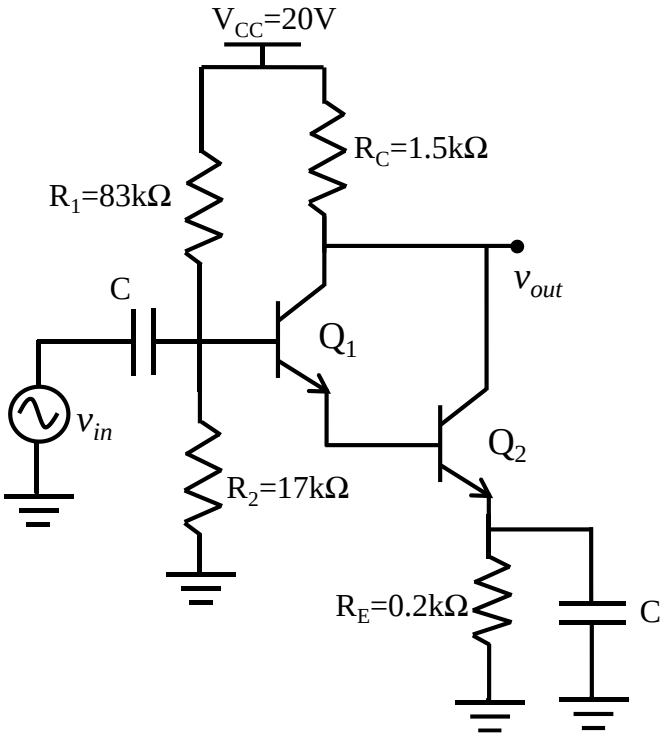
a. If the DC component of v_s is zero, find the DC emitter current.

b. Find s.s. AC R_{in} and R_{out}.

c. Find the s.s. AC voltage gain $A_V=v_{out}/v_s$

d. Find the s.s. AC current gain $A_i=i_{out}/i_i$

5.



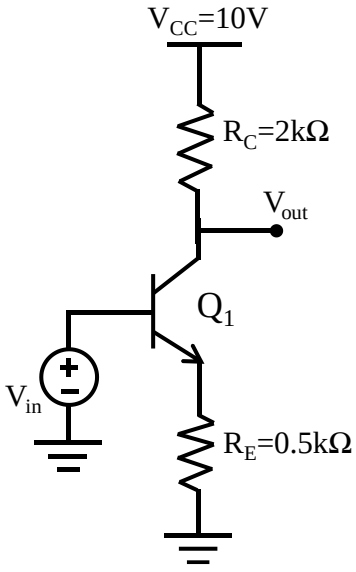
β=100
$V_{BE}(ON)$=0.7V
$V_{CE}(SAT)$=0.2V
$V_A=\infty$, V_T=26mV

a. Find the Q points (I_{C1}, V_{CE1}) (I_{C2}, V_{CE2}) and verify the transistor states.

b. Find the small signal gain $A_V = v_{out}/v_{in}$.

c. Find the s.s. R_{in} and R_{out}

6.



For the circuit shown
β is large, $V_A=\infty$
$V_{BE}(ON)$=0.7V, $V_{CE}(SAT)$=0.2V.

Find and plot the large signal V_{out} for $0<V_{in}<10$V without small signal analysis. Clearly indicate the slopes and all critical voltages.