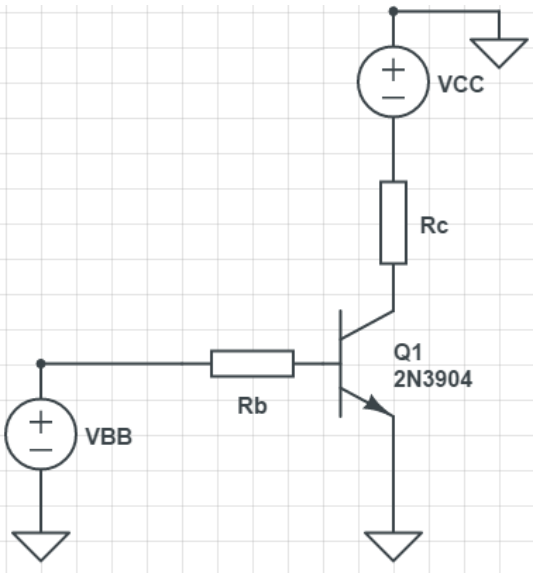
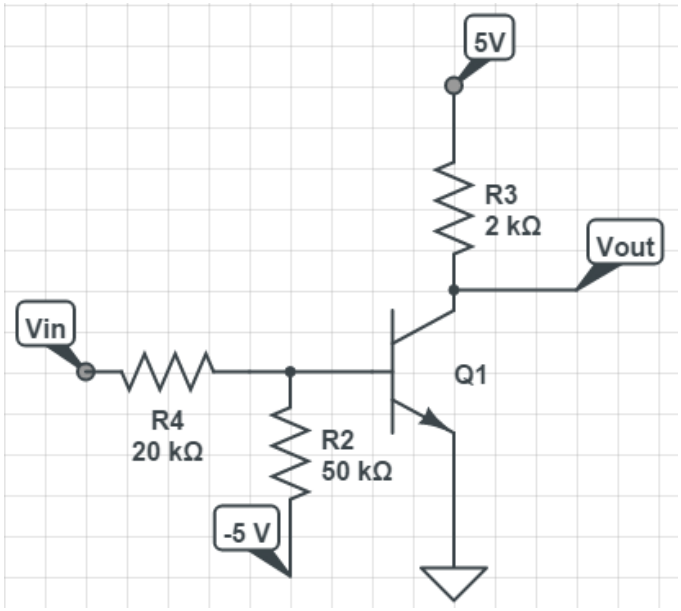
Tutorial 6
EE 101
BJT Circuits

Q1. For circuit 1 shown in the figure, suppose R_B = 270K, R_C = 1.5K, V_{BB} = V_{CC} = 6V, and $\beta = 120$. Find whether BJT operates in active region or saturation region? Find I_C, I_B, and V_{CE} . If the value of R_C is changed to 3K, find whether BJT is in active or saturation region?



Circuit:1

Q2. For the inverter circuit shown in figure 2, BJT has $\beta = 100$. Find noise margins NM_L and NM_H.

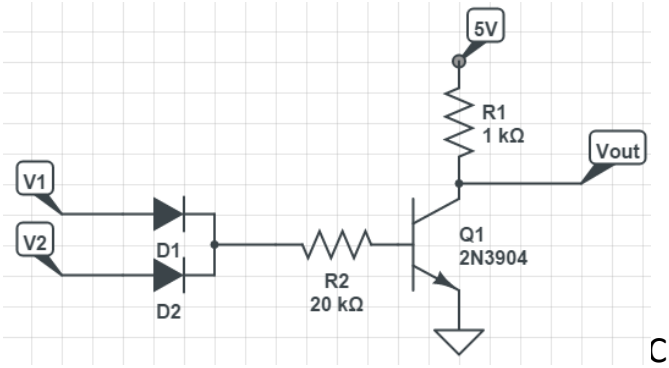


Circuit: 2

Q3. The DTL circuit shown in the circuit 3 is a NOR gate. Suppose that the voltage across a forward biased diode is 0.7V. If the low voltage is 0.2 V and high voltage is 5 V, find:

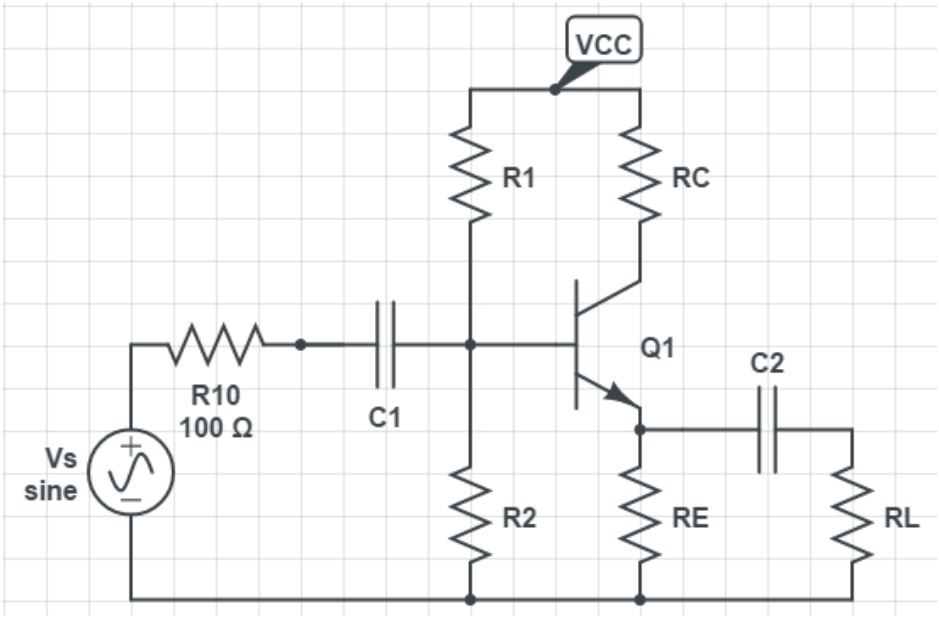
(a) The mnimum value of β required for proper operation.

(b) Noise margin for the case when β is 100.



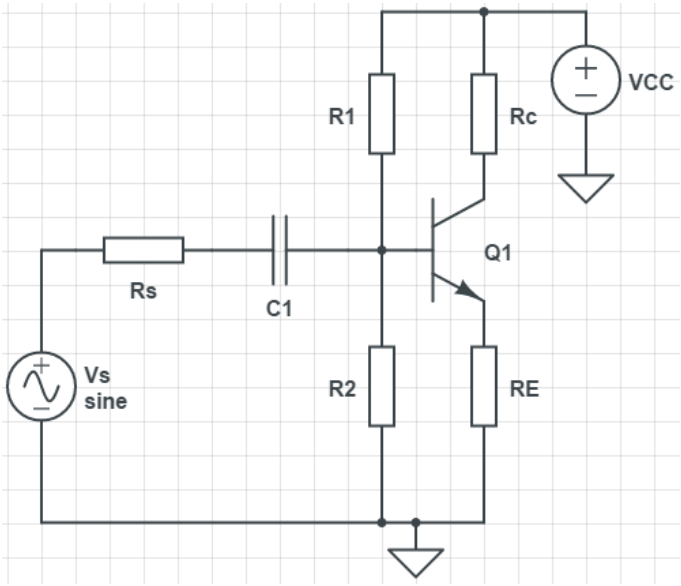
Circuit: 3

Q4. For the amplifier below, $h_{fe}=h_{FE}=100$, $R_1=R_2=400$ kΩ, $R_E=R_s=1$kΩ, $R_L=9$ kΩ, and $V_{CC}=20$V. Given that $I_{CQ}=3.09$ mA, find (a) A_v, (b) R_{in}, (c) $A_i=i_L/i_b$, (d) R_o. Does this amplifier act as a unity gain amplifier with high input resistance and low output resistance?



Circuit: 4

Q5. For the circuit given in figure 5 suppose $h_{FE} = h_{fe} =100$, $R_1 = R_2 = 26$K, $R_C = 980$, $R_E = 2$K and $V_{CC} = 10$V. Find:g_m, r_e, R_{in} and A_v.



Circuit: 5

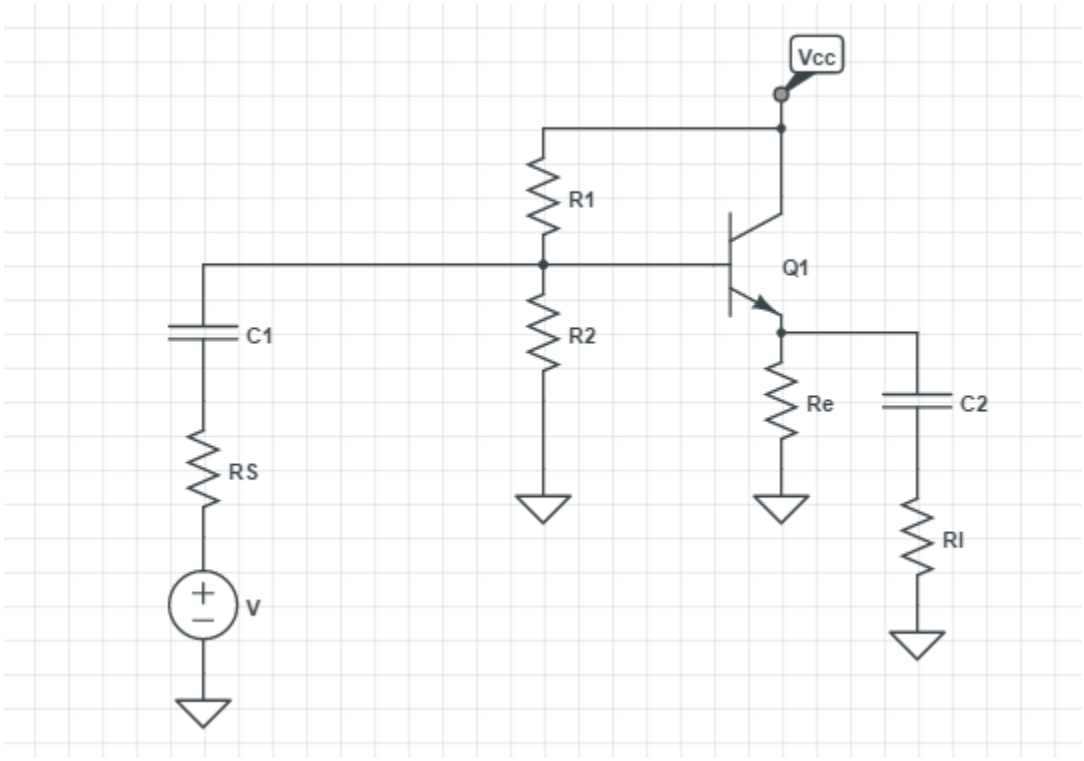


Fig.6

Problem 6. For the emitter follower circuit in figure 6 suppose that hFE=h_{fe}=100, R_1=R_2=26k-ohm, R_e=R_l=2kohm, R_s=1k ohm and V_{cc}=10V. Find (i) V_e/V_b, (ii) R_{in} and (iii) R_o

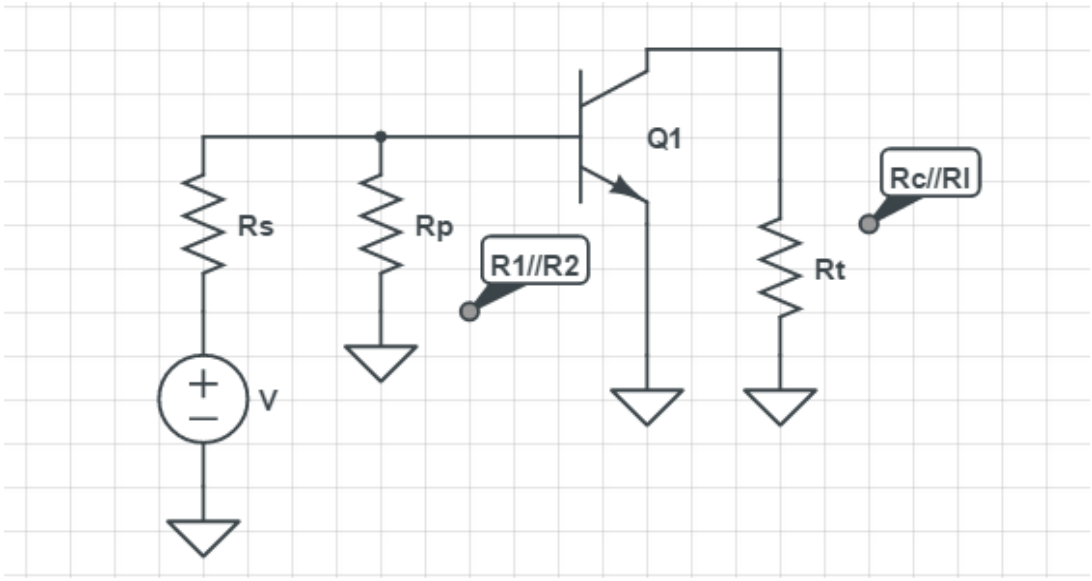
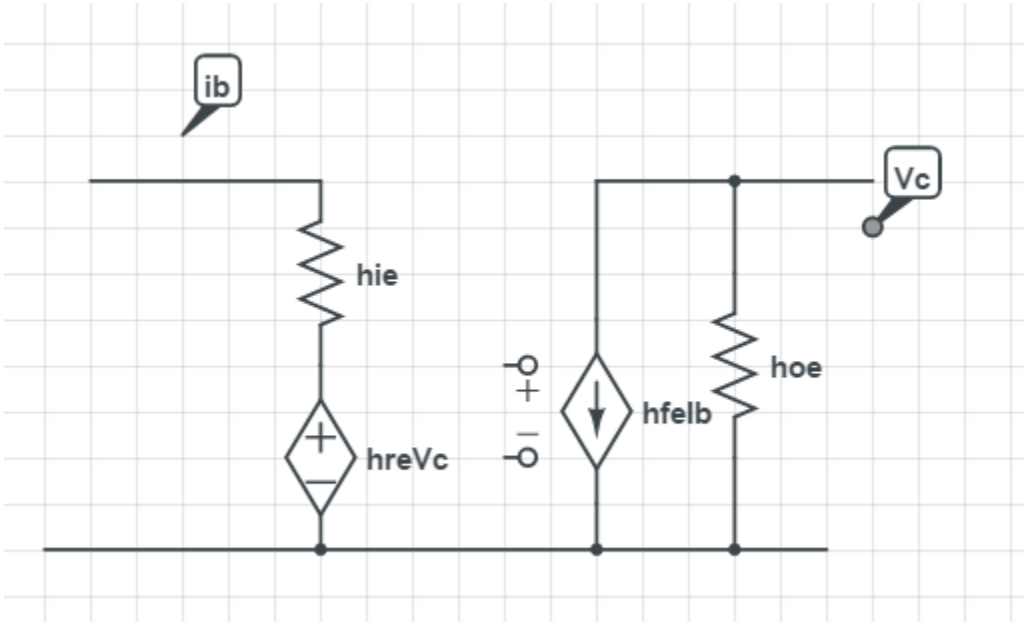


Fig.7 (a)



(b)

Problem7. Assume figure 7b to be the equivalent small signal model of the transistor in figure 7a. Calculate V_c/V_b for the circuit in the figure taking $R_c=R_L=2k$ ohm, $h_{ie}=1.3K$ ohm, $h_{re}=10^{-4}$, $h_{fe}=100$, $h_{oe}=10^{-5}$ mho. Now, repeat the calculation without h_{re} and h_{oe}. How does the answer differ.