VE311 Electronic Circuits

Homework 04

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The course homework is intended for the students to learn and to think rather that just copy and paste. This is why, me and my TAs team are confident that you're going to learn.

- Bipolar Junction Transistors
  1. What are the functions of capacitors C1, C2, and C3 in the follow Figure 1, (b) What is the magnitude of the signal voltage at the emitter of Q1, (c) What kind of transistor it is?

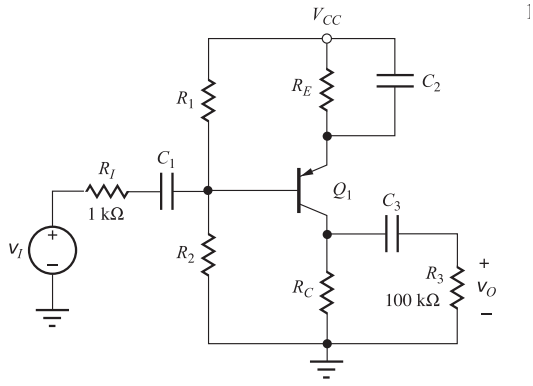

Figure 1: BJT Transistor

2. Draw the *dc* equivalent circuit and find the Q-point for the amplifier in Fig. 2. Assume $\beta_F = 75$, $V_{CC} = 10$ V, $-V_{EE} = -10$ V, $R_I = 1\text{k}\Omega$, $R_1 = 5$ kΩ, $R_2 = 10$ kΩ, $R_3 = 24$ kΩ, $R_E = 4$ kΩ and $R_C = 6$ kΩ.

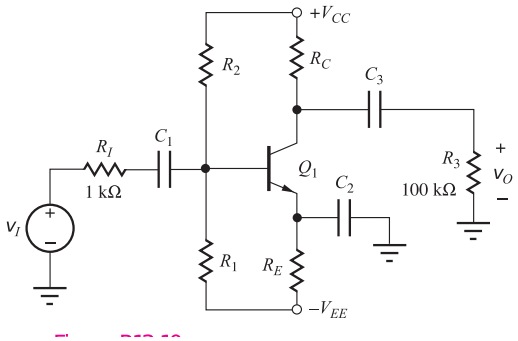

Figure 2: BJT Transistor

3. Draw the *dc* equivalent circuit and find the Q-point for the amplifier in Fig. 3. Assume $\beta_F = 100$, $V_{CC} = 9$ V, $-V_{EE} = -9$ V, $R_I = 1$ kΩ, $R_1 = 43$ kΩ , $R_2 = 43$ kΩ, $R_3 = 24$ kΩ and $R_E = 82$ kΩ.

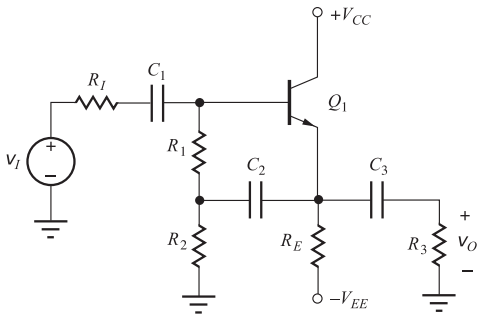

Figure 3: BJT Transistor

4. Draw the dc equivalent circuit and find the Q-point for the amplifier in Fig. 4. Assume Kn = 400 μA/V^2, V_{TN} = -5 V, V_{DD} = 16 V, R_G = 10 MΩ , R_D = 3.9 kΩ, R_I = 10 kΩ, R_1 = 2 kΩ, R_S = 1 kΩ, R_4 = 1 kΩ and R_3 = 36 kΩ.

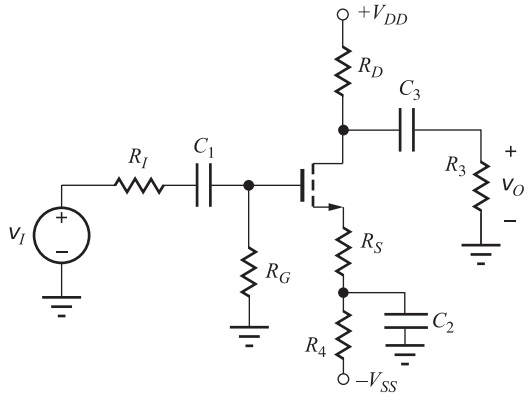

Figure 4: BJT Transistor

5. What is the voltage gain of the amplifier in Fig. 5? Assume K_n = 0.500 mA/V^2, V_{TN} =1V and λ = 0.0133V^{-1}.

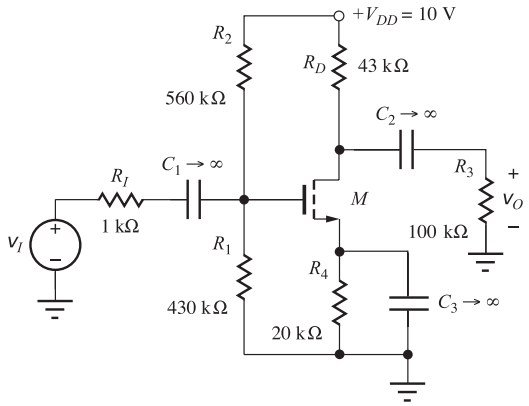

Figure 5: BJT Transistor

6. Calculate r_d for a diode with V_D = 0.6 V if I_S = 8 fA. (b)What is the value of r_d for V_D = 0V? (c) At what voltage does r_d exceed 10^{12} Ω?

7. The *ac* equivalent circuit for an amplifier is shown in Fig. 6. Assume the capacitors have infinite value, R_S =750 Ω, R_B =100 kΩ, R_C = 100 kΩ, and R_3 = 100 kΩ. Calculate the voltage gain and input resistance for the amplifier if the BJT Q-point is(40 μA,10V). Assume $\beta_0 = 100$ and $V_A = 75$V.

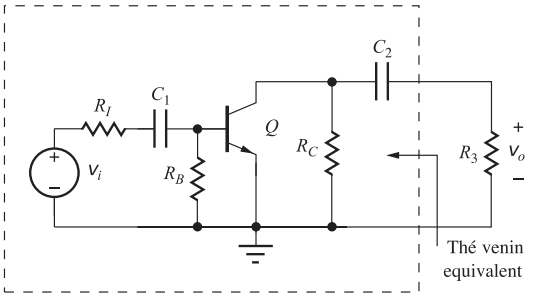

Figure 6: BJT Transistor