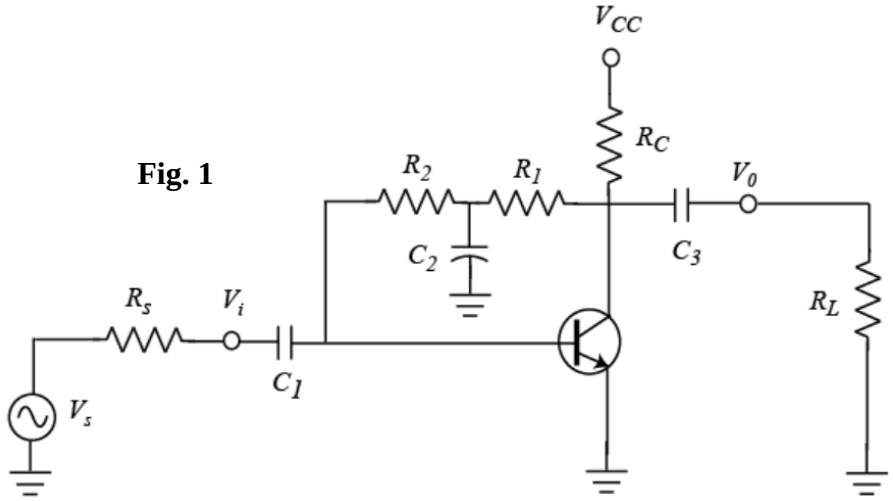
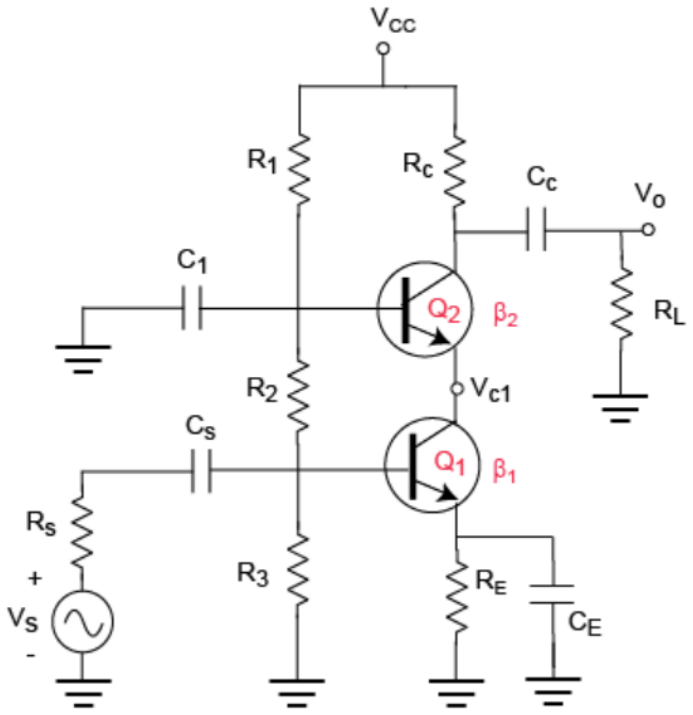
PHYS309 應用電子學一 Misterm Exam II Date: 5/20/2021 Time: 90 min

1. For the network of Fig. 1, assume V_{cc} = 15 V, R_C = 4 kΩ, R_1 = 80 kΩ, R_2 = 130 kΩ, R_s = 0.3 kΩ, R_L = 7 kΩ, C_1 = 20 μF, C_2 = 0.02 μF, C_3 = 20 μF, V_s = 15 mV, β = 150, r_0 = 40 kΩ. Determine:
   (a) I_B, I_E, (b) Z_i , (c) Z_o , (d) A_{Vs} and (e) V_o (30 pt)

Fig. 1

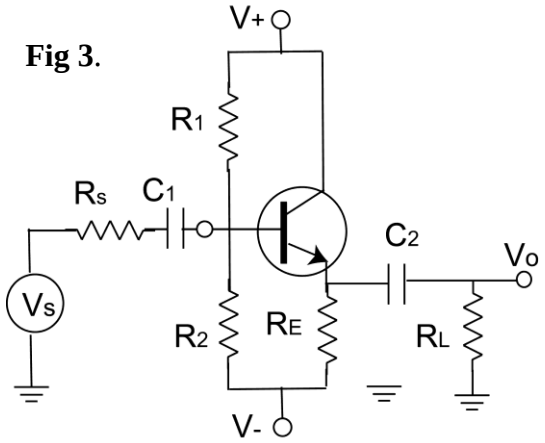


2. Consider a BJT cascade amplifier shown in Figure 2. Assume V_{cc} = 20 V, R_C = 2 kΩ, R_1 = 4.7 kΩ, R_2 = 5.6 kΩ, R_3 = 4.7 kΩ, R_s = 0.2 kΩ, R_E = 1.3 kΩ, R_L = 6.8 kΩ, C_c = 20 μF, C_E = 30 μF, C_1 = 10 μF, C_s = 5 μF, V_s = 12 mV, $\beta_1 = \beta_2 = 180$, r_0 = 60 kΩ. Determine: (a) I_{B1}, V_{B2}, I_{C2}, (b) V_{C1}, (c) A_{V2} and A_{V1} (d) V_o (30 pt)



3. Consider the circuit shown in Fig 3. The transistor parameters are β = 180 and V_A = ∞. V_+ = +9 V, V_- = - 9 V, R_1 = 10 kΩ, R_2 = 10 kΩ, R_E = 500 Ω, R_L = 300 Ω, R_s = 1kΩ, $V_{BE(on)}$ = 0.7 V. Assume C_1,C_2 and C_3 act as short for AC. Find (a) I_C (b) V_{CE} (c) Plot DC load line and mark Q point (d) Calculate the small-signal voltage gain V_o/V_s. (e) Determine the output resistance Z_0 (20pt)

Fig 3.



4. Consider the circuit shown in Fig 2. Use LT-SPICE to perform AC analysis. Draw V_o as a function of input frequency f for f =10 Hz to 1 MHz. Note V_s=*0.012sin(ωt)*. Answer all questions in Problem 2. Send your LT-SPICE file to NTHU-E-Learner system before the deadline (5/20/2020, 23:30 pm). (20 pt)

Note:

(1) BJT NPN : 2N3904 (You can pickup other BJT if you cannot find this model in your device library.)

(2) Use your student ID as the file name e.g. 101123456.asc

(2) Use the “TEXT” function (Edit → text) to write down your answers and attach them on the worksheet.