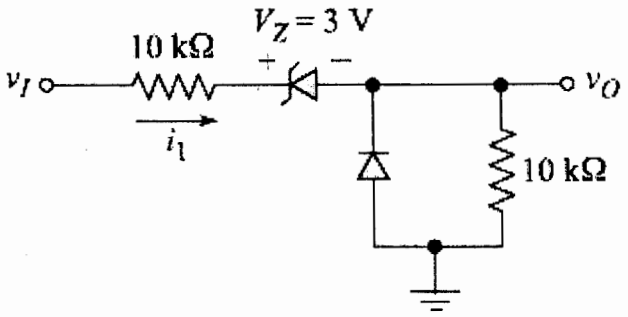
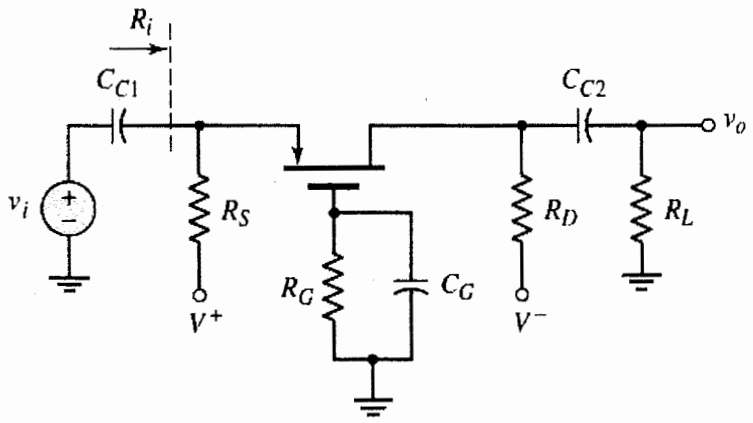
※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. For the following diode circuit. Let $V_\gamma = 0$, $v_I = V_s \sin((2\pi/60)\cdot t)$, where t is time in second and $V_s = 10$ V. (a) Calculate v_o and plot v_o versus v_I (10%); (b) Calculate i_I and plot i_I as a function of time over at least one cycle of signal (10%).



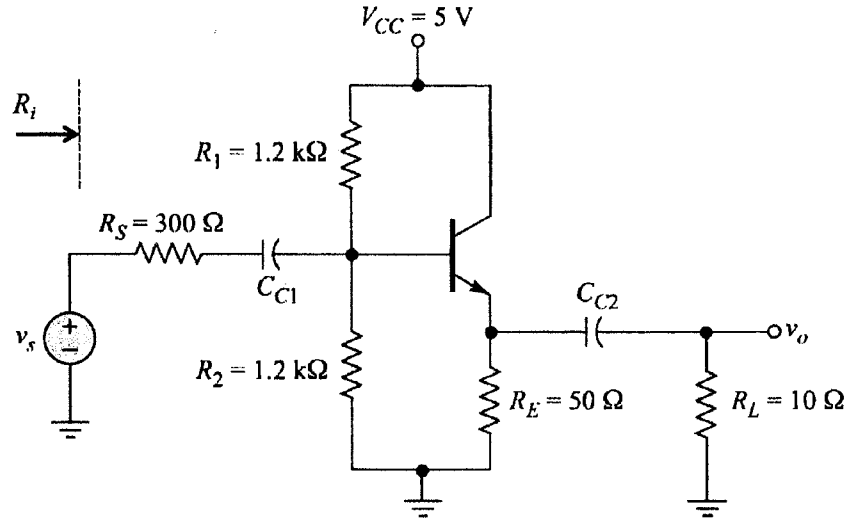
2. For the following circuit with circuit parameters $V^+ = 5$ V, $V^- = -5$ V, $R_S = 4$ kΩ, $R_D = 2$ kΩ, $R_L = 4$ kΩ, and $R_G = 50$ kΩ. The transistor parameters are: $K_P = 1$ mA/V^2, $V_{TP} = -0.8$ V, and $\lambda = 0$. (a) As $v_i = 0$, plot the equivalent circuit and find I_{DQ}, V_{SGQ}, $V_{SD(SAT)}$. (12%) (b) As $v_i = V_s \sin(\omega t)$, where t is time and $V_s \neq 0$ V, plot the small-signal equivalent circuit, and calculate g_m, small-signal gain $A_v = V_o/V_i$, and input resistance R_i (18%).



(背面仍有題目,請繼續作答)

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

3. For the following circuit with parameters of the transistor: $\beta = 100$, $V_{BE(ON)} = 0.7$ V, Early voltage $V_A = \infty$. (a) As $v_s = 0$, plot the equivalent circuit and find I_B, I_C, I_E, and V_{CE}. (10%) (b) As $v_s = V_s \sin(\omega t)$, where t is time, input signal frequency is in the range of lower frequency, and $V_s \neq 0$ V, assuming that the impedance of C_{C1} and C_{C2} may be neglected, plot the small-signal equivalent circuit, and calculate r_π, g_m, and small-signal gain $A_v = v_o/v_s$, and input resistance R_i (15%). (c) Describe the effect of capacitance on the amplifier circuit if both C_{C1} and C_{C2} were not be neglected. (5%)



4. For the following circuit, (a) What are the characteristics for an op-amp required to be considered as ideal? (3%); (b) Calculate the transfer function (4%). (c) If the input signal is with an angular frequency of ω, derive the frequency of oscillation (8%) and ratio of R_2/R_1 (5%) that may eliminate the imaginary part of the transfer function.