※ 考生請注意：本試題 ☑可 □不可 使用計算機

1. Each diode cut-in voltage in the circuit in Figure 1 is 0.7V. Determine I_{D1}, I_{D2}, I_{D3}, and ν_o for $\nu_I = 3.0$ V. (12 %)
2. Consider the circuit shown in Figure 2. The threshold voltages of the n-channel transistors are V_{TN} = 0.8 V, and the threshold voltages of the p-channel transistors are V_{TP} = -0.8 V. The conduction parameters are all equal. If ν_{o2} = 0.6V, determine the values of ν_{o3}, ν_{o1}, and ν_I. (18 %)
3. Consider the circuit shown in Figure 3 with transistor parameters of $\beta_1 = \beta_2 =$ 120, $V_{BE1(on)} = V_{BE2(on)} =$ 0.7V, and $V_{A1} = V_{A2} = \infty$. (a) Determine the overall small-signal voltage gain $A_\nu = \nu_o / \nu_s$. (b) Determine the input resistance R_{is} and the output resistance R_o. (c) Determine the maximum undistorted swing in the output voltage. (20 %)
4. Consider the amplifier whose small-signal AC equivalent circuit is shown in Figure 4, assume that the parameter values for the circuit are given as follows.
   C_c = 1 μF, C_1 = 10 pF, C_2 = 1 pF, R_s = 75 Ω, R_{in} = 2.5 kΩ, R_L = 1 kΩ, g_m = 0.04 A/V.
   (a) Find the upper and lower 3-dB frequencies of the frequency response. (10%)
   (b) What is the gain-bandwidth product for this amplifier ? (5%)
5. An amplifier has a dc gain of 10^5 and poles at 10^4 Hz, 10^6 Hz, and 10^8 Hz. If this amplifier is operated in a closed negative feedback loop with a frequency-independent feedback factor β.
   (a) Is this amplifier unity-gain stable ? Please explain the reason for your answer. (7%)
   (b) What are the gain and phase margins if the amplifier is operated with $\beta = \frac{1}{100}$?(8%)
6. It is required to design a class B amplifier with the output voltage across a load R_L=8 Ω shown in the Figure 5. Neglecting the effects of finite V_{BE} and V_{CEsat}.
   (a) Determine the load power, the supply power, and the power-conversion efficiency. (12%)
   (b) Find the maximum power dissipation P_D in the transistors. (8%)

(背面仍有題目,請繼續作答)

系所組別： 電機系、微電子工程研究所、電腦與通信工程研究所

考試科目： 電子學

考試日期：0220，節次：1

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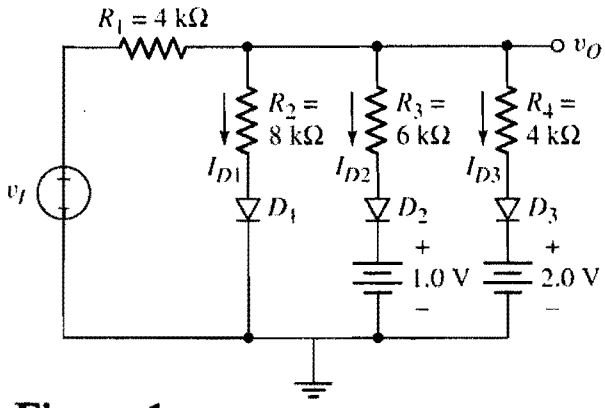


Figure 1

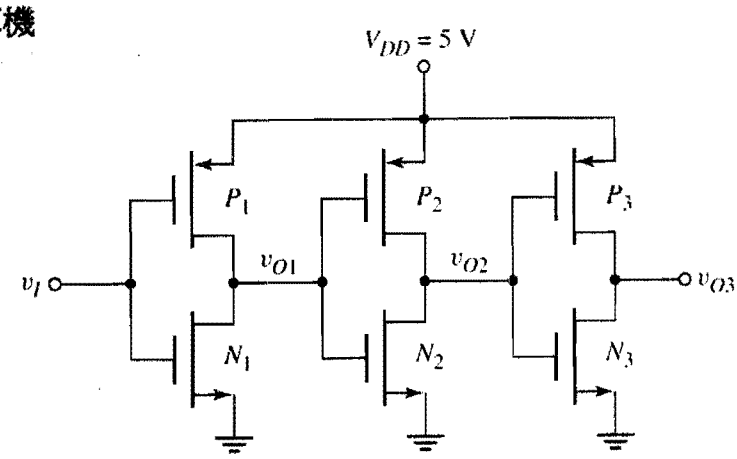


Figure 2

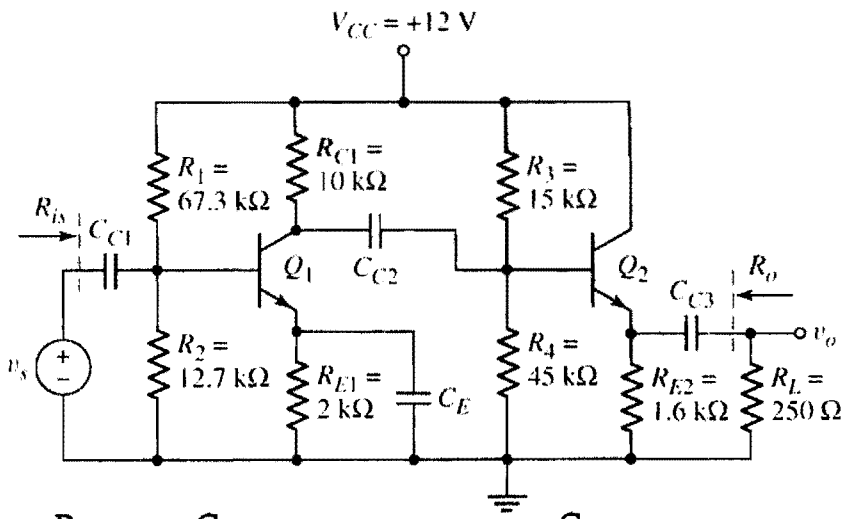


Figure 3

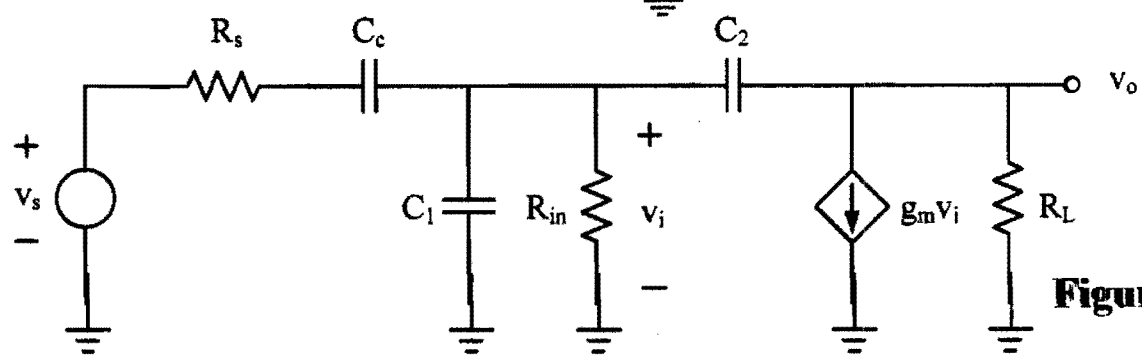
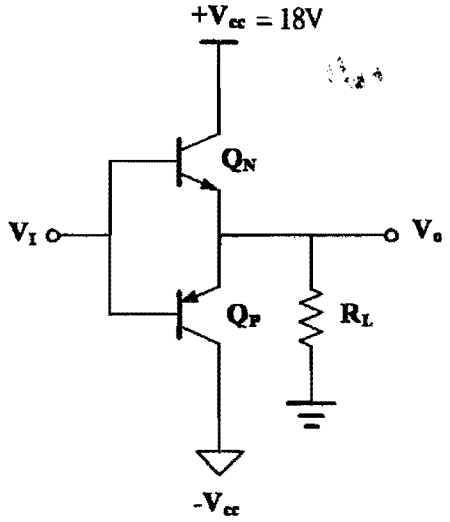
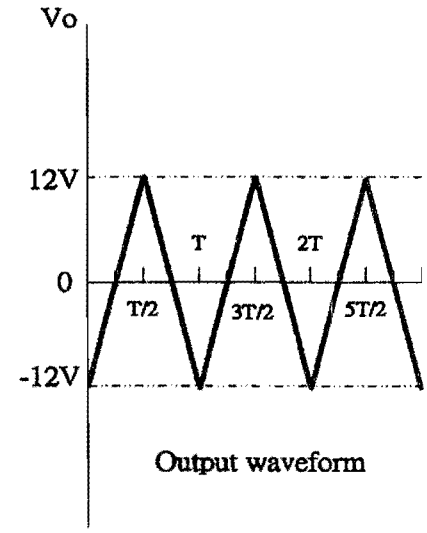


Figure 4





$$f = \frac{1}{T} = 60\text{Hz}$$

Figure 5