

系所組別： 生物醫學工程學系乙組

考試科目： 電子學

考試日期： 0225 · 節次： 1

1. A transistor amplifier has the transfer characteristic  $v_o = 10 - 10^{-11} \exp(40v_i)$ , which applies for  $v_i \geq 0V$  and  $v_o \geq 0.3V$ . Find (a) the negative and positive saturation levels and the corresponding voltages of  $v_i$ , and (b) the value of dc bias voltage  $V_I$  that results in  $V_O = 5V$  and the voltage gain at the corresponding operating point. (20%)
2. Derive the closed-loop voltage gain of the amplifier circuit as shown in Fig. 1 with the assumption that the op amp is ideal. (20%)

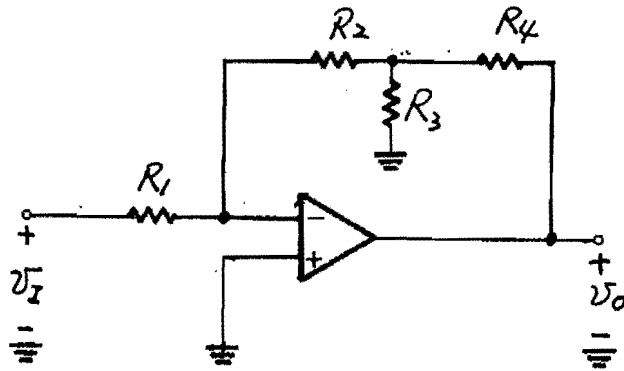


Fig. 1

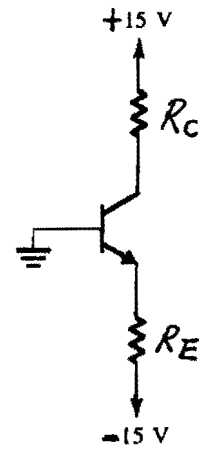


Fig. 2

3. The transistor in the circuit of Fig. 2 has  $\beta = 100$  and exhibits a  $v_{BE}$  of  $0.7V$  at  $i_C = 1 \text{ mA}$ . Find the values of  $R_C$  and  $R_E$  so that a current of  $2 \text{ mA}$  flows through the collector and a voltage of  $5V$  appears at the collector. (15%)

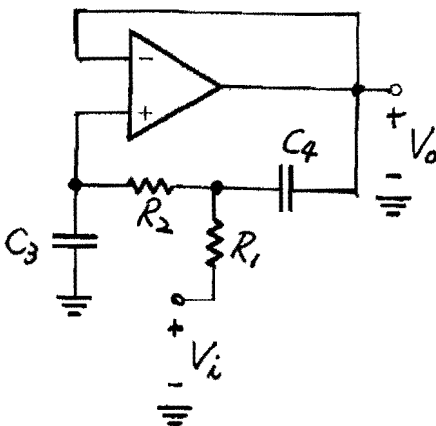


Fig. 3

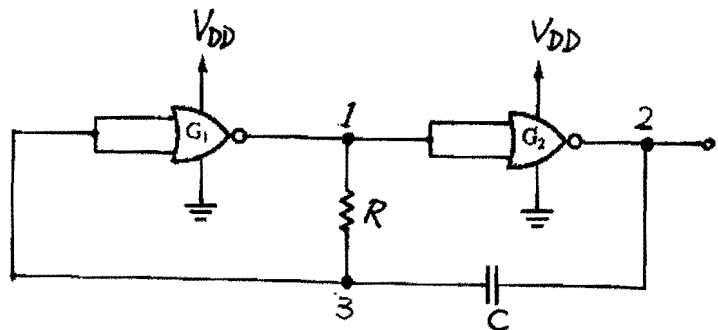


Fig. 4

(背面仍有題目,請繼續作答)

4. Determine the transfer function  $V_o(s)/V_i(s)$  for the circuit in Fig. 3, and find the pole frequency  $\omega_0$  and pole factor  $Q$ . (15%)
5. A simple astable multivibrator circuit is shown in Fig. 4. Draw the waveforms for the points labeled as 1, 2, and 3. (15%)
6. Describe the basic block diagrams for three types of analog-to-digital converters. (15%)