本試題是否可以使用計算機： ☑可使用 ， □不可使用 　（請命題老師勾選）

1. Determine f(t)=? (20%)

(a) $F(S) = \dfrac{2S^3 + 4S^2 + 2}{(S^2 + 2s + 17)(S^2 + 4s + 20)}$

(b) $F(S) = \dfrac{S^2 + 4}{(S^2 + 9)(S^2 + 6s + 3)}$

2. Fig. 1 shows the 741 op-amp circuit. (20%)

(a) Describe basic operational principle of this three-stage amplifiers.

(b) Describe output short-circuit protection if the circuit in the emitters of Q_{14} and Q_{20} exceeds about 20 mA.

(c) Describe the basic function of transistors Q_{18} and Q_{19} (including R_{10})

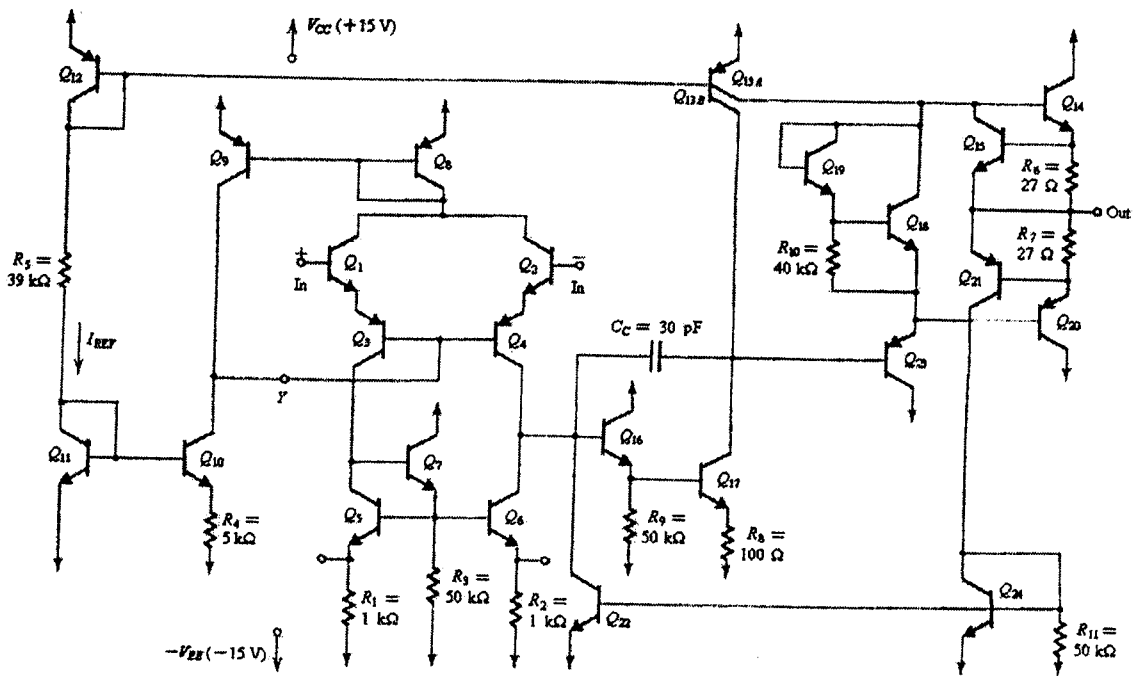(d) Draw a small-signal equivalent circuit for the input stage, the second stage and the output stage.

Fig. 1

3. Obtain the differential equation relating for $V_o(t)$ in the network of Fig. 2. (10%)
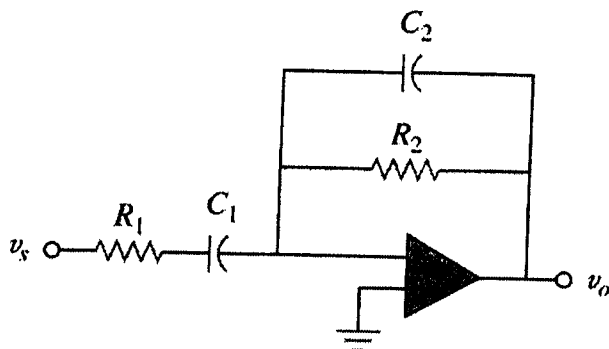

Fig. 2

（背面仍有題目，請繼續作答）

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4. Fig. 3 shows a monostable multi-vibrator implemented using the 555 IC together with an external resistor R and an external capacitor C. To trigger the monostable multi-vibrator, a negative input pulse is applied to the trigger input terminal. (15%)

(a) Clearly described the wave forms of $v_C(t)$ and $v_O(t)$.
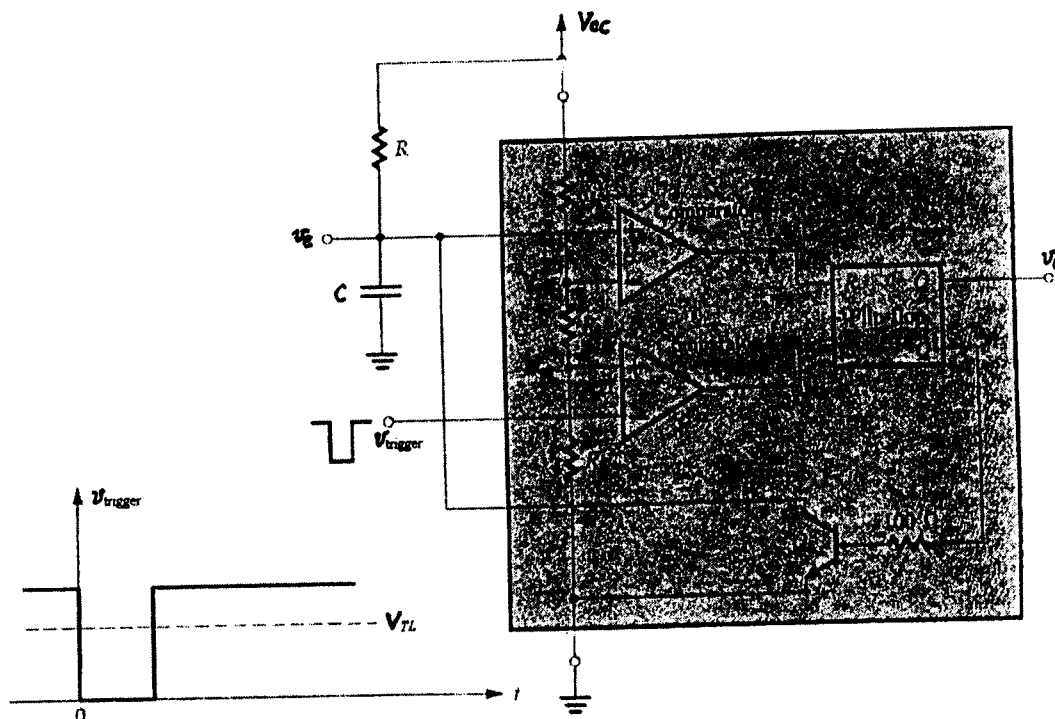
(b) Obtain the width of the pulse T.

Fig. 3

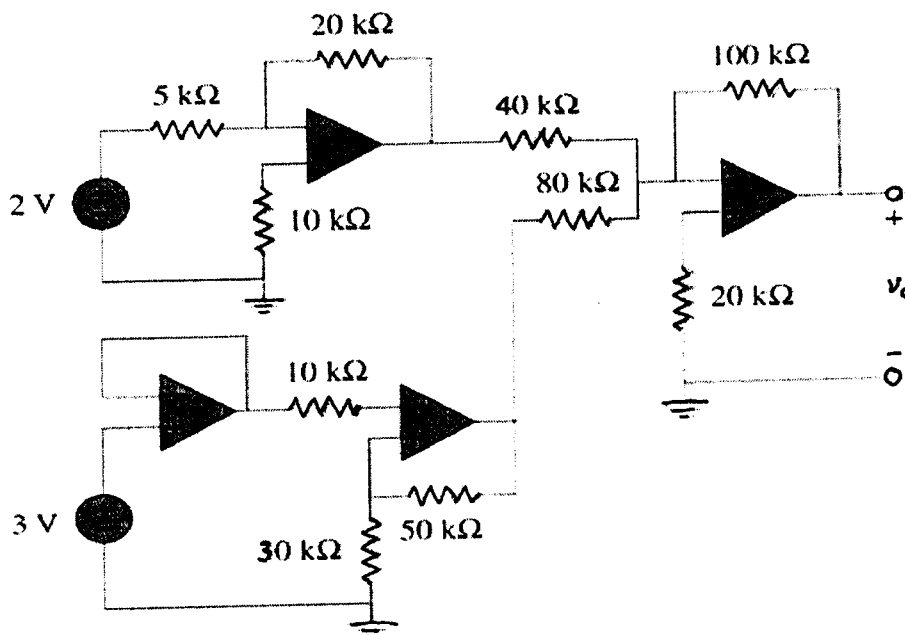5. Determine V_o in the op amp circuit in the Fig. 4. (20%)

Fig. 4

6. In Fig. 5, obtain the expression of input impedance $Z_{in} \equiv \dfrac{V_1}{I_1}$ as shown in figure 5. (Assume A_1 and A_2 are ideal op amp.) (15%)
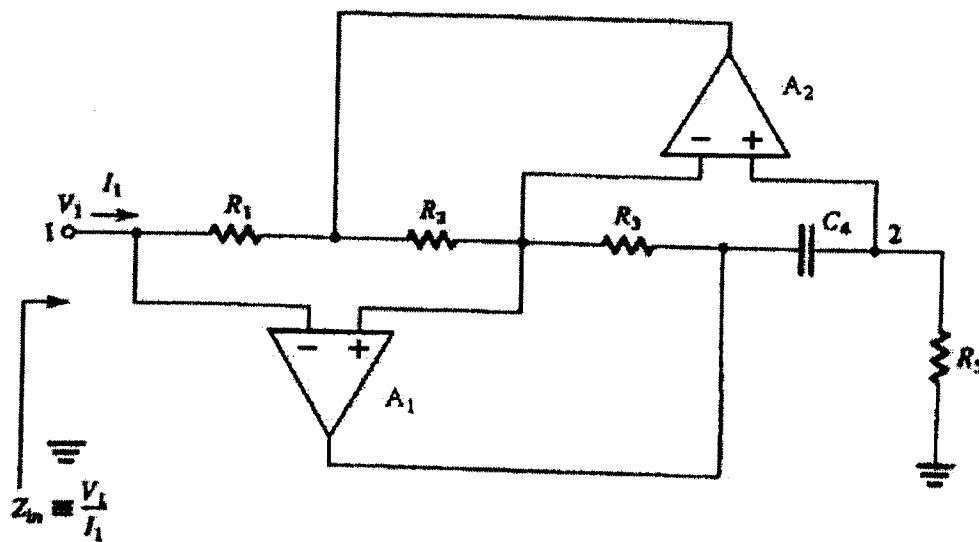

Fig. 5