國立臺北科技大學

九十三學年度光電工程系碩士班入學考試

電子學試題

填准考證號碼

注意事項：

1. 本試題共 8 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

Problem 1: [15%]

(a) A silicon diode is in series with a 2-KΩ resistor and a 10-V power supply. Approximately what is the current in the circuit, if the diode is forward-biased? [3%]

(b) If the measured diode drop is 0.6V at 1mA, obtain a more accurate value for the current in the circuit? [3%]

(c) If the battery is reversed and if the diode breakdown voltage is 7V, find the current in the circuit. [3%]

(d) A second identical diode is added in series opposing (the two anodes are connected together). Approximately what is the current in the circuit? [3%]

(e) The supply voltage in part (d) is reduced to -4V, find the current in the circuit and the voltage across each diode. [3%]

Problem 2: [12%]

Using the simple constant-voltage-drop (0.7V) for each of the diodes, find the transfer characteristic of the circuit shown in Fig 1.

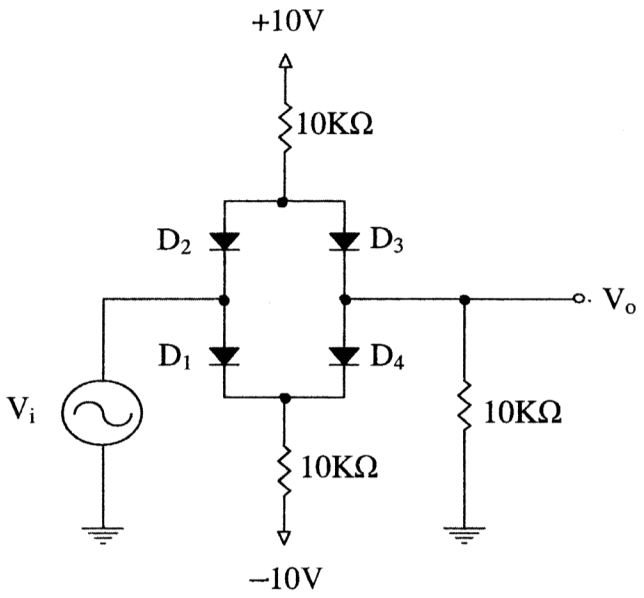


Fig. 1

Problem 3: [12%]

For the Wilson current sink show in Fig. 2, using identical transistors find I_2 in terms of I_{c1}, I_{c2}, I_1 and β.

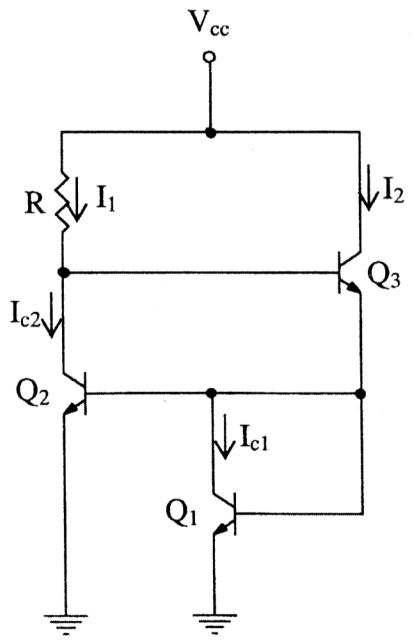


Fig. 2

注意：背面尚有試題

1:t3-4

Problem 6: [12%]

A third-order low-pass filter is shown in Fig. 5. Find V_o / V_s

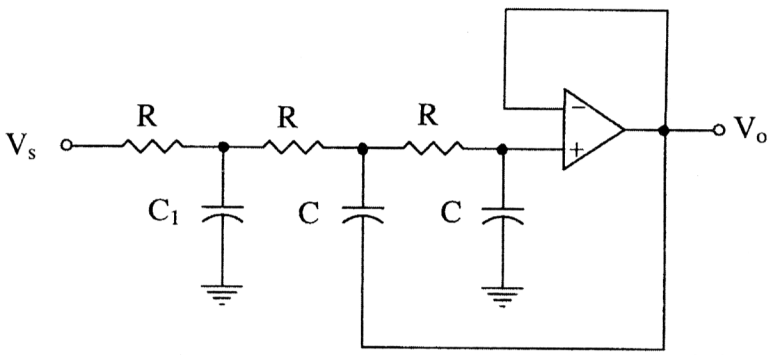


Fig. 5

Problem 7: [12%]

An active RC band-pass filter as show in Fig. 6, verify $\frac{V_o(s)}{V_s(s)} = \frac{-S/R_1C}{S^2 + (\frac{2}{R_3C}) + \frac{1}{R'R_3C^2}}$

where $R' = \frac{R_1 R_2}{R_1 + R_2}$

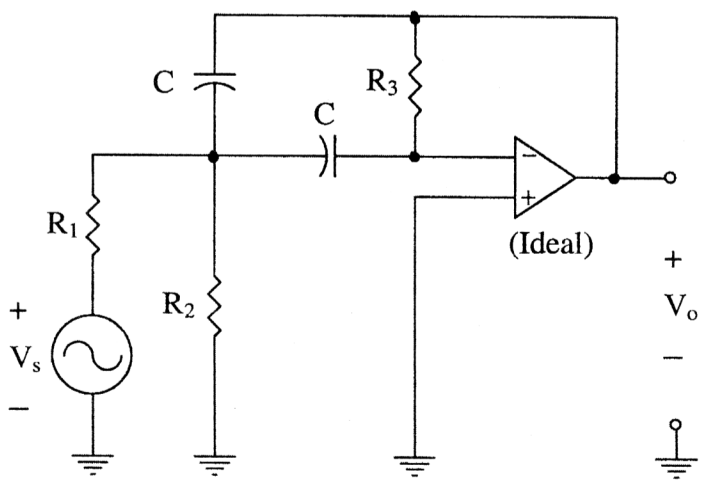


Fig. 6

Problem 4: [13%]

(a) Identify the topology of Fig. 3. [3%]

(b) Assume R_1=20K, R_2=80K, R_D=10K, R_L=10K, g_m=4000μv, calculate A_{vf}
C_D is arbitrarily large. All resistors are in ohms. [10%]

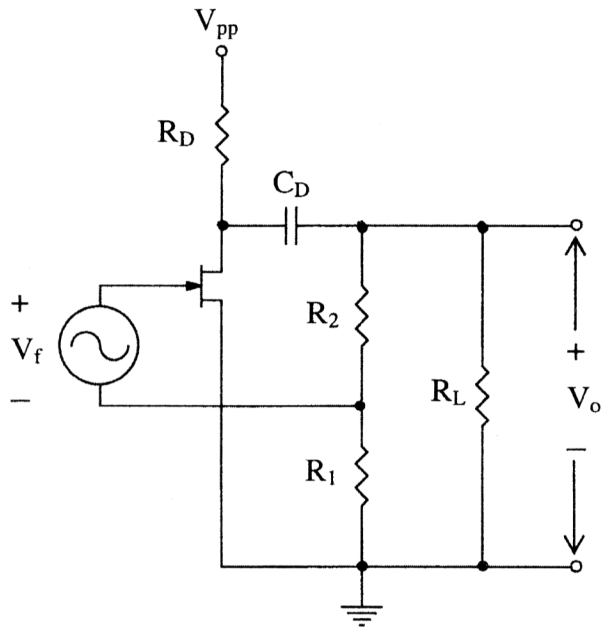
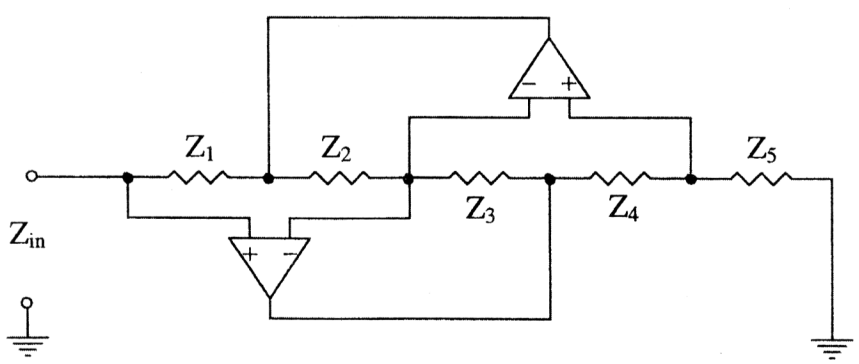


Fig. 3

Problem 5: [12%]

For the circuit show below (Fig. 4), find Z_{in} = ?



(Assume all op-amps are ideal.)

Fig. 4

Problem 8: [12%]

The following Fig. (Fig. 7) illustrates a square-wave generator using a Schmitt comparator, where D_1 and D_2 are two identical Zener diodes with V_2 (Zener breakdown voltage) = 6.3V and V_o (diode forward voltage) = 0.7V.

Plot to scale the waveforms of the output voltage V_o and the capacitor voltage V_c, showing the positive and negative peak values, and also the period of the waves.

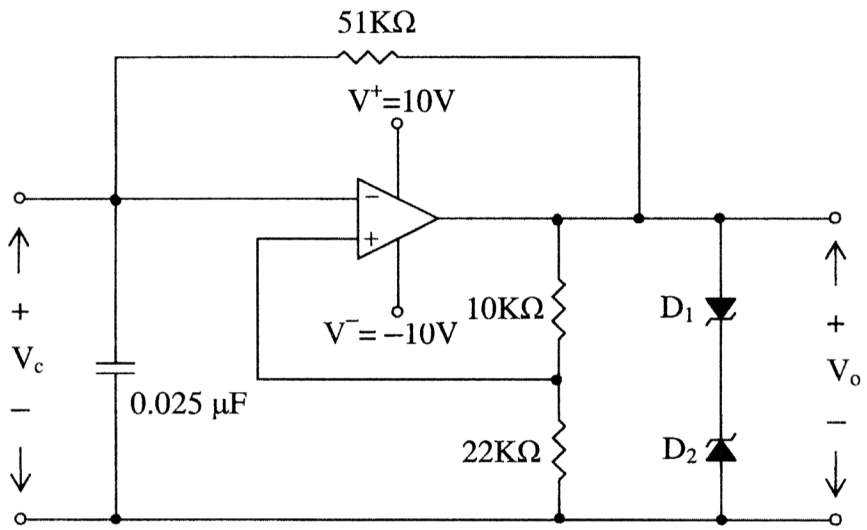


Fig. 7