

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. (10%) An oven is supposed to have an equilibrium temperature of 352°C after 10 minutes. Now we have an oven, and the technician took 12 measurements to measure this oven. The result is shown in Table 1. Did this oven pass the test? Why?

Number	Temperature	Number	Temperature
1	360°C	7	342°C
2	349°C	8	353°C
3	350°C	9	348°C
4	358°C	10	340°C
5	347°C	11	354°C
6	344°C	12	355°C

Table 1.

2. (12%) The time base error is the one source of inherent error in all frequency and period counters. Find and describe the total time base inaccuracy which is the sum of several individual errors.
3. (12%) [1] Determine maximum and minimum output voltage available from the regulator circuits in Fig.1 when $V_z = 8\text{ V}$, $R_2 = 15\text{ k}\Omega$, $R_3 = 8\text{ k}\Omega$, and $R_4 = 4\text{ k}\Omega$. (4%)
- [2] Find and explain to add one transistor and two resistances to create a voltage regulator with output current limiting function based on Fig.1 (8%).

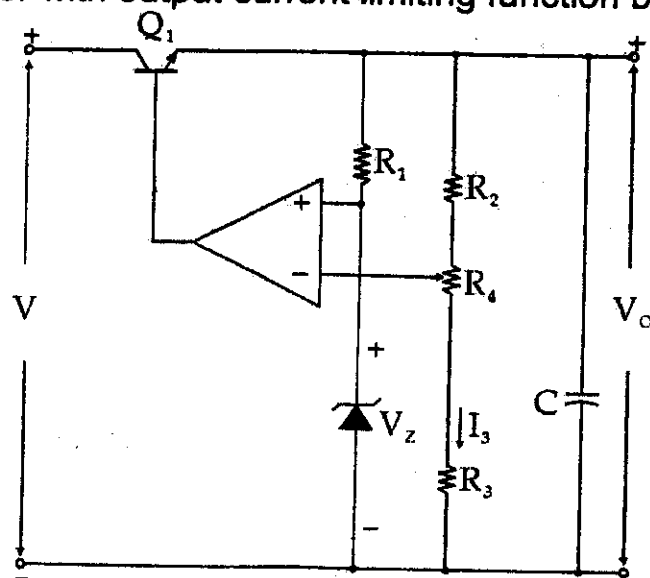


Fig.1

(背面仍有題目,請繼續作答)

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）

4. (16%) We have an unknown component, and this component is measured by two bridge circuits that are shown in Fig. 2. In circuits, we have standard capacitor $C_3 = 0.05 \mu F$, and $R_4 = 1 k\Omega$, $f = 100 Hz$. The measured result is shown in Table 2.

- [1] Which bridge we should choose? Why? (6%)
- [2] What is the name of the selected bridge? (4%)
- [3] Calculate R_1 and R_3 in the selected bridge. (6%)

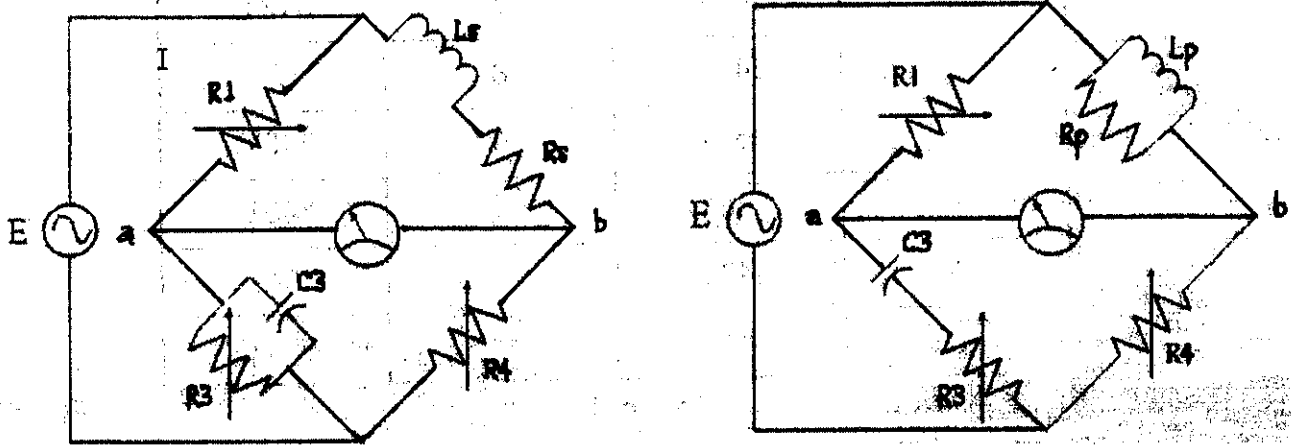
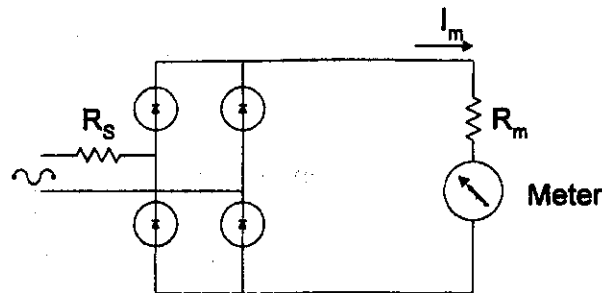


Fig.2

Component	Value
R_s	0.374Ω
L_s	$126 mH$
R_p	$16.8 k\Omega$
L_p	$126 mH$

Table 2

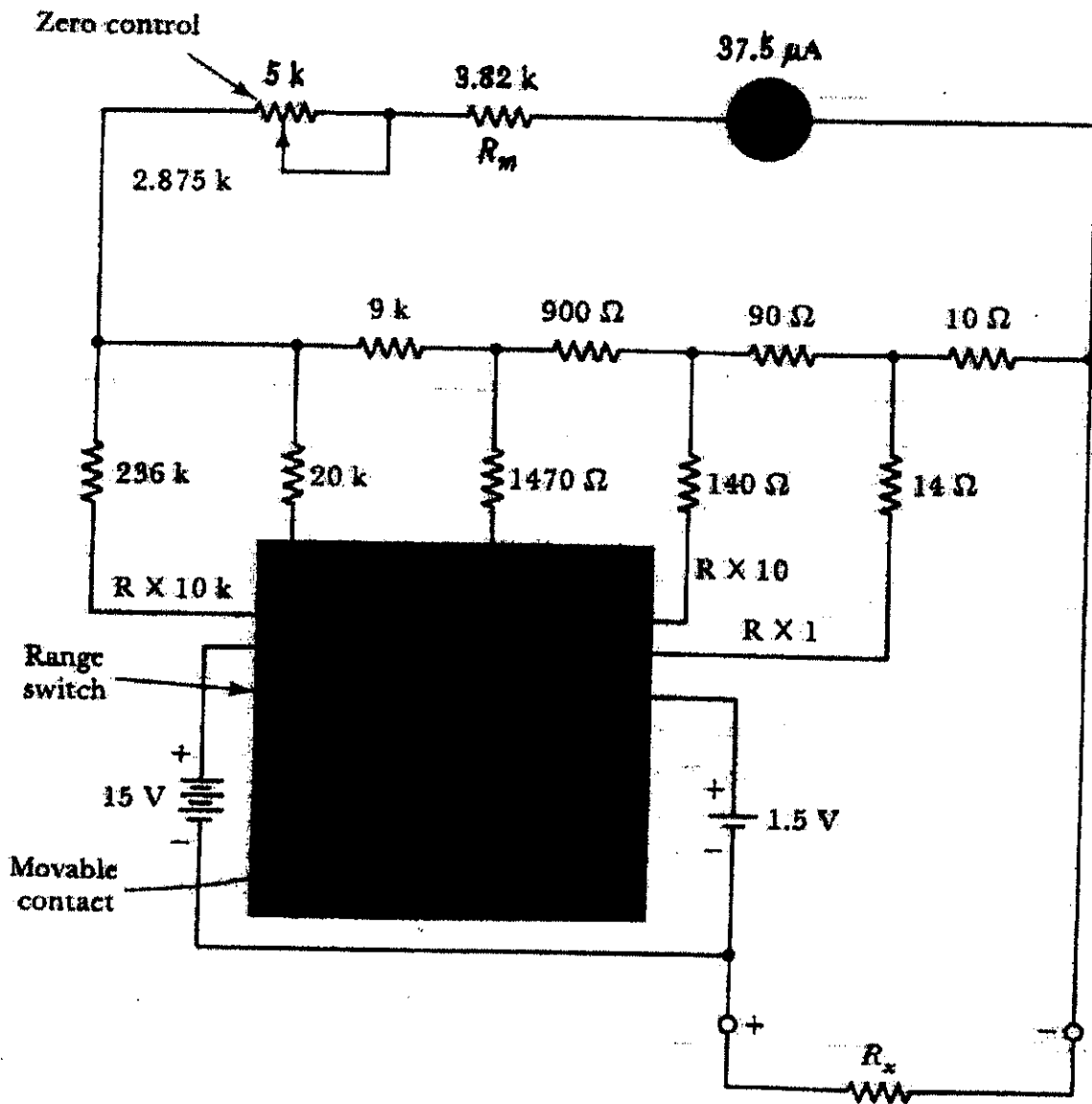
5. (12%) An ac voltmeter (Fig. 3) uses a bridge rectifier with silicon diodes and a PMMC instrument with $FSD = 75 \mu A$. If the meter coil resistance is 900Ω and the multiplier resistor is $708 k\Omega$, calculate the applied rms voltage when the voltmeter indicates FSD and $0.5 FSD$. Determine the new multiplier resistance required for the voltmeter to change its range to $300 V FSD$.



AC voltmeter
Fig. 3

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）

6. (20%) Calculate the meter current for the ohmmeter circuit (Fig. 4) shown below on its $R \times 10$ range when R_x is (a) 0Ω , (b) 400Ω , and (c) 80Ω . Calculate the meter current for the ohmmeter circuit shown below on the ($R \times 100$) and ($R \times 10 k$) ranges when $R_x = 0 \Omega$.



(a) Multirange ohmmeter circuit

Fig. 4

7. (18%) Describe and compare the impedance measurement devices: (a) Impedance Analyzer, (b) Network Analyzer, (c) Time Domain Reflectometry.