※ 考生請注意：本試題 ☑可 □不可 使用計算機

1. **(9%)** (a) Describe and explain the measurement factors of **precision, accuracy,** and **resolution.**
(6%) (b) A meter reads **28.00 with ±2% error,** find the possible range of real data.
(5%) (c) Describe and explain the relationship between **resolution** and **sweep time** in **spectrum analyzer.**

2. **(12%)** (a) A Hay bridge is shown in **Fig. 1.** Please derive the equations of **Q** and express **L1** and **R4** in terms of **Q.**
(6%) (b) Now, a **Hay bridge** has a **0.003 μF** standard capacitor for **C1, R2 =10 kΩ,** and **R3=6 kΩ.** Balance is achieved with a **2 kHz** supply frequency when **R1=0.1 k Ω.** Calculate the value of **L1**and **R4** and its **Q.**

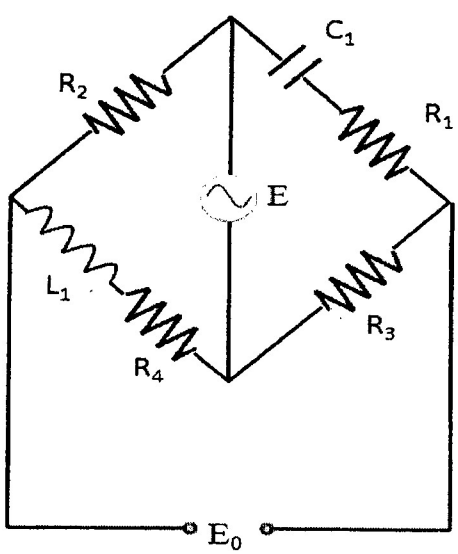

Fig. 1

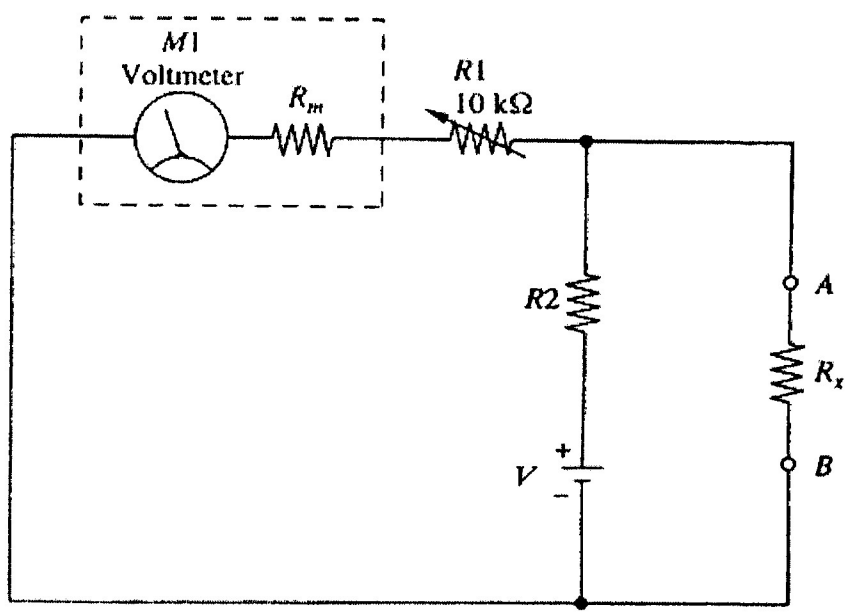

Fig. 2

3. **(12%)** A series-parallel ohmmeter circuit is shown in **Fig. 2.** There are three resistors in the circuit: **Rm** is the internal resistor of the voltmeter, **R1** is the zero-control resistance, **R2** is a resistance in series with the battery, and **Rx** is the unknown resistor. The value **E** is the voltmeter reading value when nodes A and B are opened and the value **e** is the voltmeter reading value when the **Rx** is connected across nodes A and B. The Rx connects to nodes A and B when we are measuring. Please calculate the formula of the Rx using **R1, R2, Rm, E,** and **e.**

4. **(24%)** A digital frequency meter (**Fig. 3**) uses a time base consisting of a **1 MHz** clock generator frequency divided by six decade counters. Determine the meter indication **(a)** when input frequency is **5 kHz** and the time base output is selected at the sixth decade counter and **(b) when the** input frequency is **2.9 kHz** and the time base output is selected at the fifth decade counter. **(c)** Rearrange the frequency meter for **reciprocal counting.** Determine the **error** that can occur when a **30 Hz** frequency is measured on this system.

(背面仍有題目，請繼續作答)

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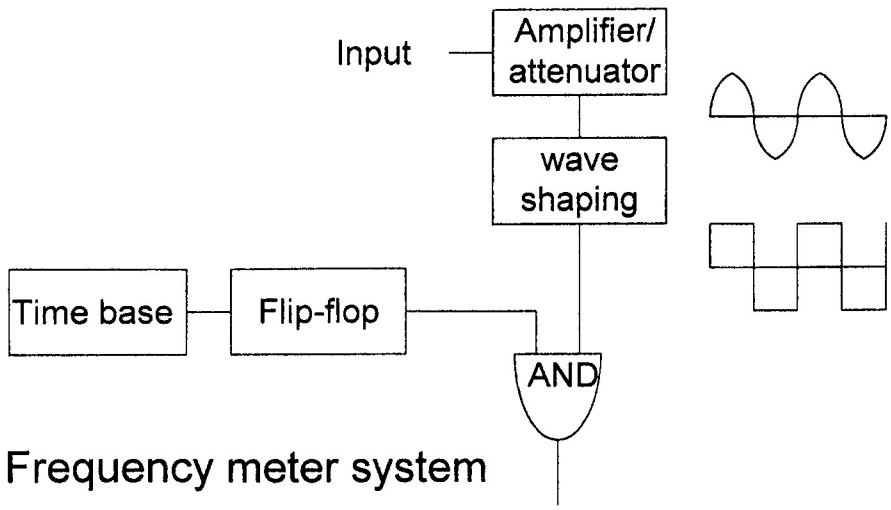
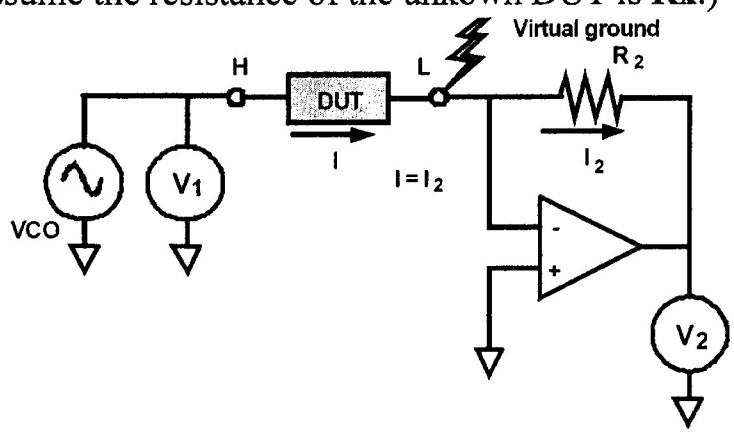


(Fig. 3)

5. **(10%)** Describe the operation theory of **auto balancing bridge** that shown below (**Fig. 4**). (Assume the resistance of the unkown DUT is **Rx**.)



(Fig. 4)

6. **(16%)** Explain the operation principle of the **basic bridge-controlled heater** circuit.

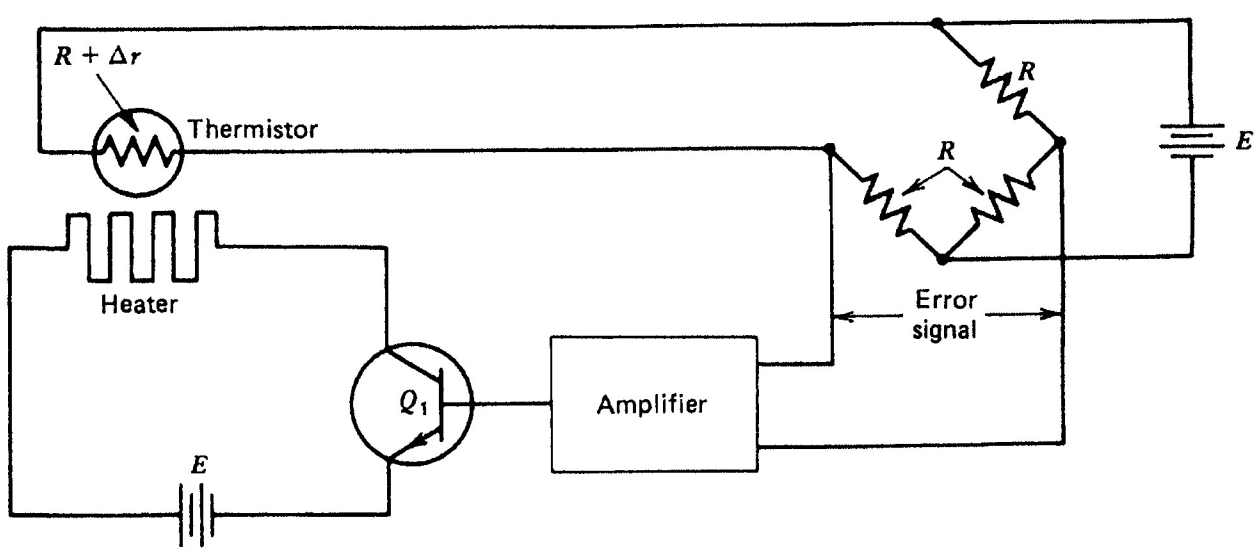


Fig. 5. Basic bridge-controlled heater circuit.