

※ 考生請注意：本試題可使用計算機

1. (10%) Express a signal level of 0.5 mV rms in dBm.
2. (10%) $A=100 \pm 3\%$ and $B=300 \pm 1\%$. If C is the sum of A and B, what is the relative error of C?
3. (15%) Design a multi-range voltage meter with the shunt mode, as shown in Fig. 1. The full-scale current (I_{FSD}) of the PMMC meter is $50 \mu\text{A}$, and its internal resistance R_m is 100Ω . The desired full-scale voltages (V_{FSD}) of the multi-range voltage meter are 10 V, 1 V, and 100 mV. Please find the values of multiplier resistor R_{S1} , R_{S2} , R_{S3} .

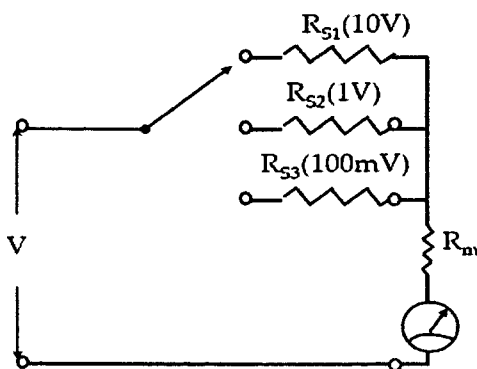


Fig. 1

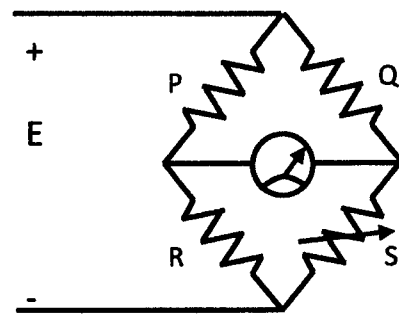


Fig. 2

4. (15%) The parameters in a Wheatstone bridge (Fig. 2) are $P=2 \text{ k}\Omega$, $Q=4 \text{ k}\Omega$, $S=3 \text{ k}\Omega$, $E=10 \text{ V}$, and minimum adjustable $\Delta S=\pm 1 \Omega$. Please find the value of the unknown resistance R , and the resolution of this Wheatstone bridge.
5. (25%) The Schering bridge of Fig. 3 is operated at balance. Find the equivalent-series resistance and capacitance of R_x and C_x .

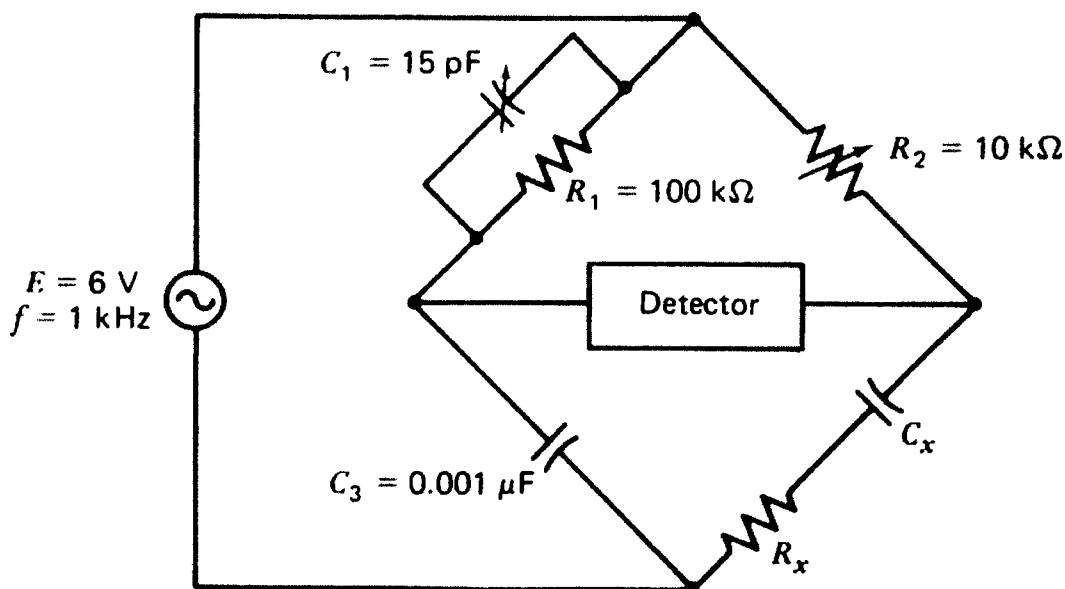


Fig. 3

(背面仍有試題，請繼續作答)

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6. (25%) Describe the operation theory and functions of a digital multimeter (Fig. 4)

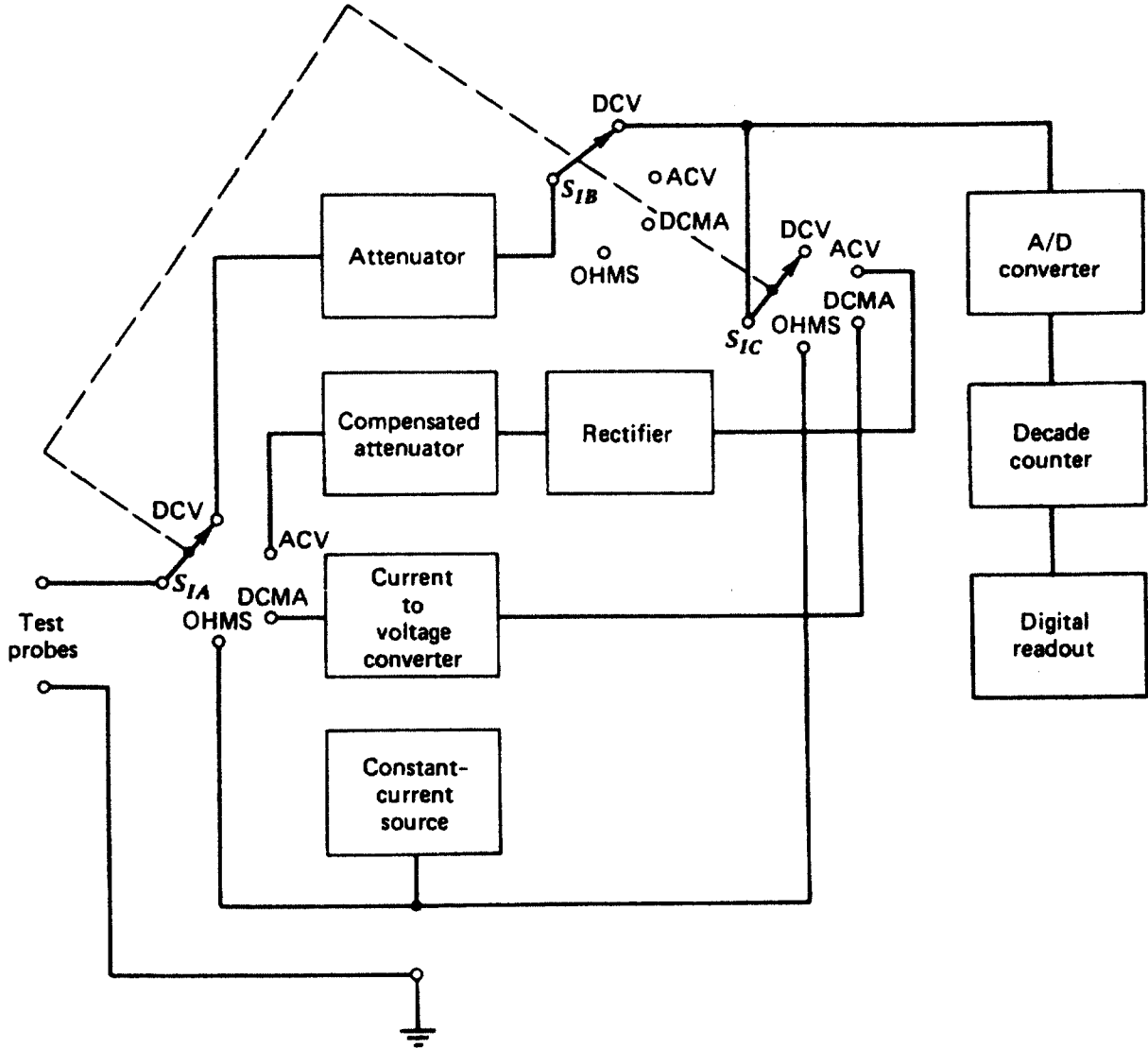


Fig. 4