

國立成功大學
110學年度碩士班招生考試試題

編 號：172

系 所：電機工程學系

科 目：電儀表學

日 期：0202

節 次：第 2 節

備 註：可使用計算機

- ※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。
1. (20%) Fig. 1 shows an ac voltmeter with $I_{FSD} = (2/\pi) \text{ mA (avg)}$, $R_m = 1 \text{ k}\Omega$. $FSD = 100 \text{ mV (ac)(rms)}$. Calculate (a) $R_3 = ?$ (b) When $V_{in} = 10 \text{ mV(ac) (rms)}$, what does the deflection read? I_m (current thru meter) =? (c) What is the sensitivity of this ac voltmeter? (d) To make $FSD = 1 \text{ V (ac)(rms)}$, what should we modify?

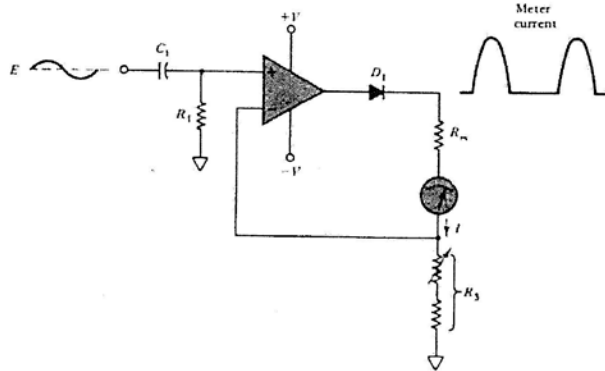


Fig. 1. AC voltmeter

2. (16%) Explain the terminologies, mark correct/wrong, or the difference of the following terms:
 (a) Is dBm a voltage unit (Yes/No)? (b) Null measurement; (c) Difference between accuracy and precision;
 (d) Theoretical errors;
3. (14%) Digital voltage meters are composed of ADC and digital display. Please explain how the dual slope ADC working? (Hint: you may refer to the system block shown below)

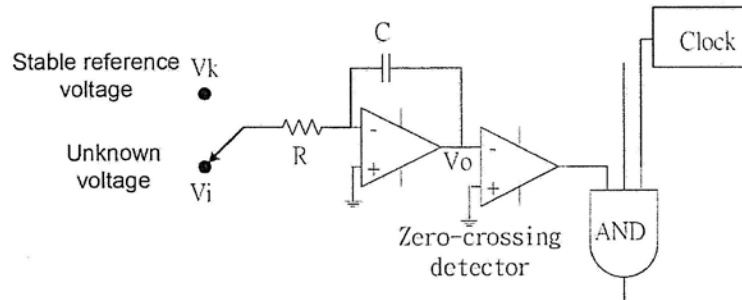


Fig. 2. system block of a dual slope ADC

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4. (20%) (a) Determine the quantizing error (expressed by %) for an ADC with a 16-bit output. (b) Determine the minimum number of output bits required for an ADC to give a quantizing error **less than 1%**.
5. (15%) Calculate the maximum and minimum resistance that can be measured by a Wheatstone bridge (as in Fig. 3) which can have $P = (1\text{ k}\Omega, 5\text{ k}\Omega, \text{ or } 10\text{ k}\Omega)$, $Q = (1\text{ k}\Omega, 5\text{ k}\Omega, \text{ or } 10\text{ k}\Omega)$, and S adjustable from $1\text{ k}\Omega$ to $6\text{ k}\Omega$.

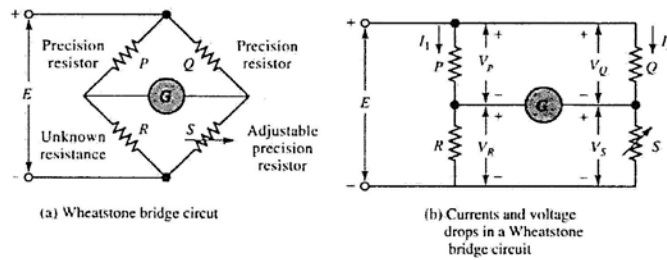


Fig. 3. Wheatstone bridge circuit for accurate resistance measurement.

6. (15%) The Q-meter circuit in Fig. 4 is in resonance when $E = 100\text{ mV}$, $R = 5\Omega$, and $|X_L| = |X_C| = 100\Omega$. Calculate the Q of the coil and the voltmeter indication.

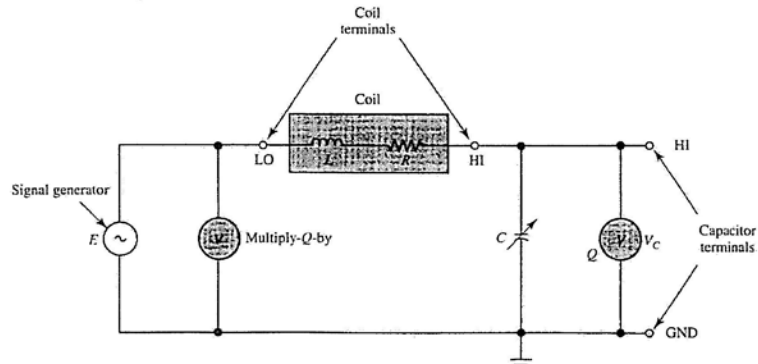


Fig. 4. A basic Q meter circuit.