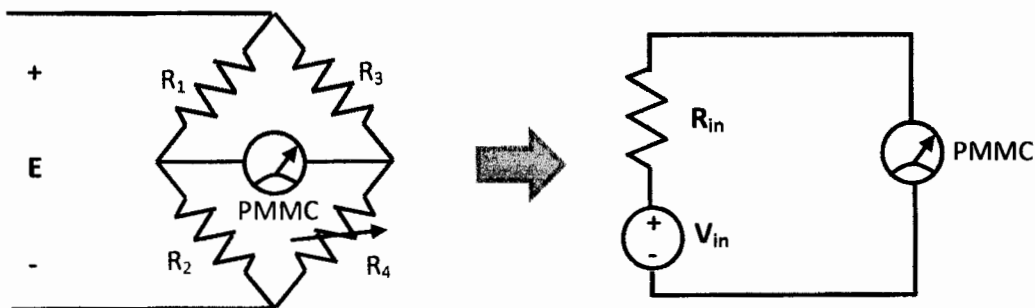


※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

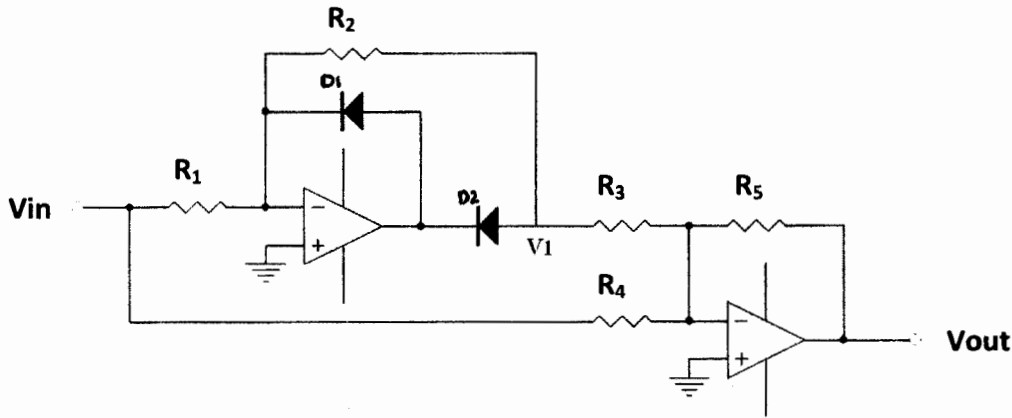
1. (10%) The current flowing through a $1\text{ k}\Omega$, $\pm 5\%$ resistor was measured as 2.5 mA . The measuring error is 3% . Please calculate the possible range of the voltage across the resistor.
2. (10%) Please explain the meanings and definitions of the following two terms: (a) Accuracy (b) Precision.
3. (15%) Please list and explain the three main forces that influence the movement of the pointer in a Permanent Magnet Moving Coil (PMMC) deflection meter.
4. (15%) When calculating the sensitivity/resolution of a Wheatstone bridge using a PMMC, most of the bridge circuit can be replaced by its Thévenin equivalent circuit, as shown in the figure below. For the case that $E=5\text{V}$, $R_1=10\text{ k}\Omega$, $R_3=16\text{ k}\Omega$, $R_4=8\text{ k}\Omega$, and the PMMC points at zero (i.e., the null condition is reached), please calculate R_{in} and V_{in} .



5. (a) (5%) In a frequency counter, find the frequency of a signal in Hertz if the Decimal Counting Assembly (DCA) reads 4236 and the time base is set to 5 ms .
(b) (8%) List all factors that affect time base inaccuracy and explain them briefly.
6. (a) (6%) Please define resolution bandwidth (RBW) selectivity in a spectrum analyzer.
(b) (6%) If the settings of a spectrum analyzer are $k = 3$, $\text{RBW} = 1000\text{ Hz}$, and $\text{span} = 30\text{ kHz}$, please calculate the sweep time (ST).

7. The figure below is a rectifier, where $R_1=2k\Omega$, $R_2=2k\Omega$, $R_3=3k\Omega$, $R_4=R_5=6k\Omega$.

- (a) (6%) Explain the operation of the circuit when a sine wave is applied to V_{in} .
- (b) (6%) Plot the related waveforms of V_1 and V_{out} when V_{in} is a 5Vp-p sine wave with 0.2s period.



8. The figure below is an operational amplifier voltage regulator, given that $R_2 = 4\text{ k}\Omega$ and $V_z = 6\text{ V}$.

- (a) (5%) If the range of V_o is 8 V-40 V, choose the proper R_3 and R_4 .
- (b) (8%) To avoid short circuit, the current-limiting circuits are absolutely necessary in this system. Please add a current-limiting circuit for this system and explain its operation.

