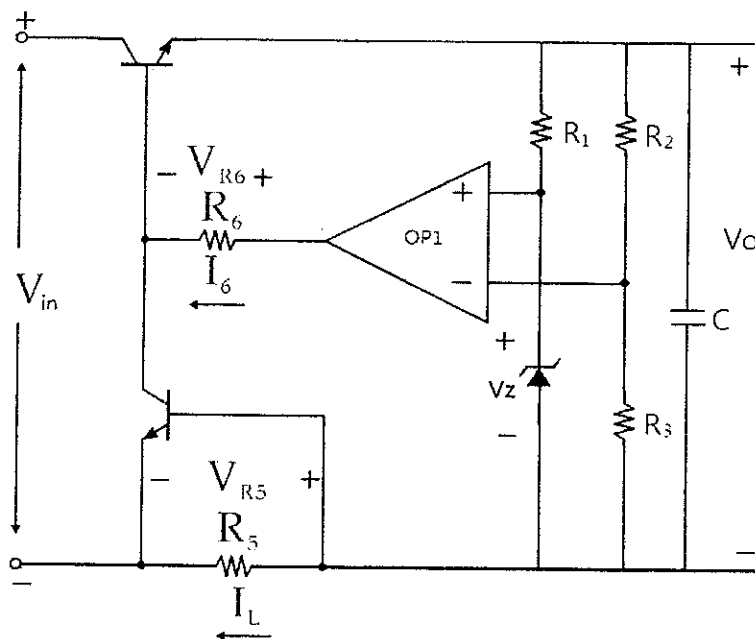


※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (7%) The clock frequency of a 12-bit dual-slope ADC is 1 MHz. Please calculate the maximum sampling rate of this ADC.
2. (8%) A digital multi-meter claims that it has  $5\frac{1}{2}$  digits. What is the maximal number that this multi-meter can show on its display?
3. (15%) The circuit of a dc regulator with current-limiting circuit is shown below. Let  $V_{in} = 12\text{ V}$ ,  $V_o = 5\text{ V}$ ,  $R_1 = 497\ \Omega$ ,  $R_3 = 30\text{ k}\Omega$ , and the Zener diode has  $V_z = 3\text{ V}$  and  $Z_z = 3\ \Omega$ . The maximal allowable load current is 100 mA. The BJT threshold voltage is 0.7V. (a) Determine the values of  $R_2$ . (8%) (b) What is the value of  $R_5$ ? (7%)



4. (10%) Please draw the block diagram of a basic unregulated ac-to-dc power supply.
5. (10%) Please explain the function of a Logic Analyzer. What kind of chip/device/system will you use a logic analyzer to test? What are the differences between a logic analyzer and an oscilloscope?
6. (a). (6%) Please explain the differences between a superheterodyne spectrum analyzer and a swept TRF (Tuned Radio Frequency) spectrum analyzer.  
 (b). (6%) Please describe the function of a holdoff period in an oscilloscope.  
 (c). (8%) Please describe and explain a static error.
7. (10%) If the accuracy of a PMMC (Permanent Magnet Moving Coil) meter is  $\pm 1.5\%$ , find the relative error in the reading 0.8 FSD.

8. (10%) (a) A triangle wave is shown below, please find  $V_{rms}$  and  $V_{avg}$ .

(10%)(b) If the input signal is a pure sinusoidal wave, and  $R_s = 0.5\text{ k}\Omega$ ,  $I_{FSD} = 10\text{ mA}$ ,  $V_{diode} = 0.7\text{ V}$ , find  $R_m$  for full-scale  $25\text{ V}_{rms}$ .

