

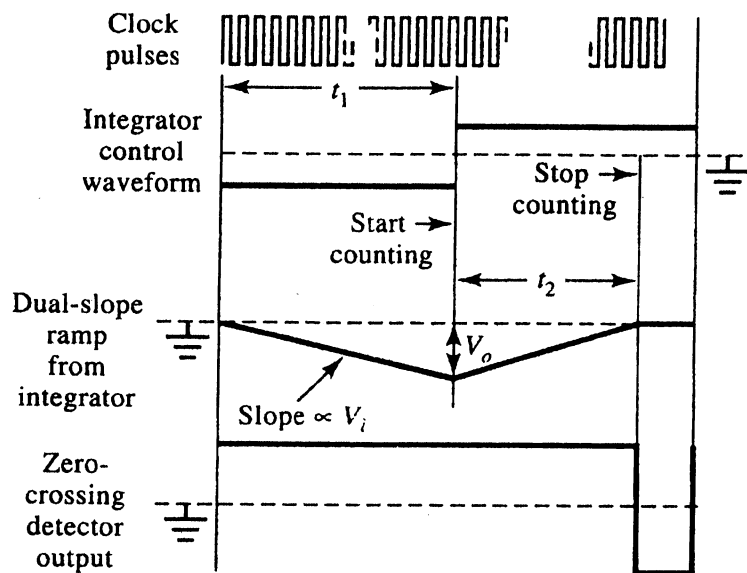
系所組別： 電機工程學系戊組

考試科目： 電儀表學

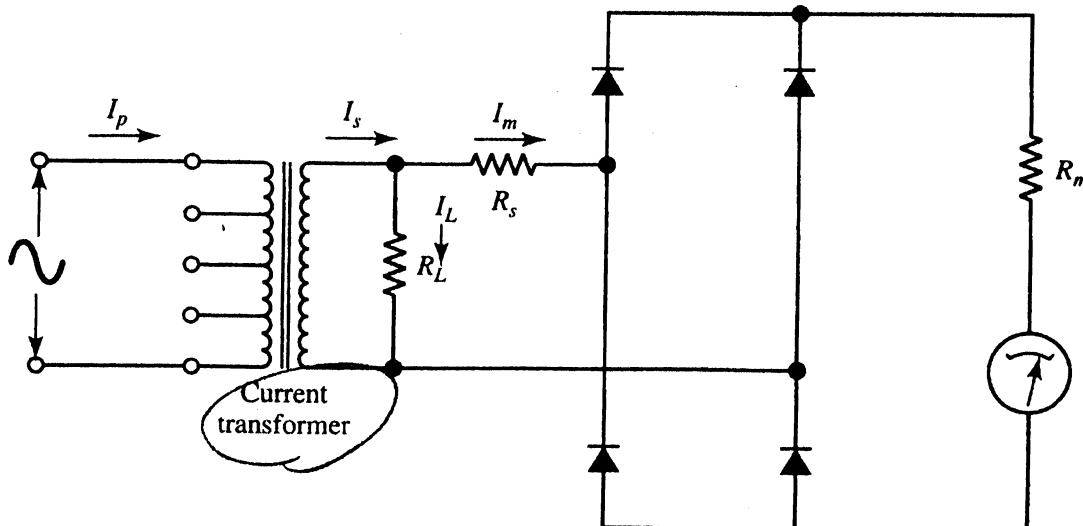
考試日期： 0307，節次： 2

※ 考生請注意：本試題 可 不可 使用計算機

1. (a) Explain the operation of a **dual-slope-integrator analog-to-digital converter** (ADC). (7%)
- (b) What are the quantizing error and the resolution of a 12-bit ADC? (6%)
- (c) Sketch the block diagram and system waveforms for a **digital voltmeter** (DVM) that uses a dual-slope integrator. (7%)



2. A **rectifier ammeter** with the circuit shown below is to give FSD for a primary current of 250 mA. The PMMC meter has FSD = 1 mA and $R_m = 1.7 \text{ k}\Omega$. The current transformer has $N_s = 500$ and $N_p = 4$. The diodes each have $V_F = 0.7 \text{ V}$, and the series resistance is $R_s = 20 \text{ k}\Omega$. (a) Calculate the required value of R_L ; (15%) (b) How to change the range of the instrument? (5%)



3. Explain what is "Auto balancing bridge" that used in the impedance analyzer (IA). Why usually a high-Q / low-D component is hard to be measured using an IA? What is the better choice for measuring the loss of high-Q components? (20%)

(背面仍有題目,請繼續作答)

※ 考生請注意：本試題 可 不可 使用計算機

4. Draw graphs to show TDR (Time Domain Reflectometry) measurement results of
- (a) **Open** circuit termination ($Z_L = \infty$) (3%);
 - (b) **Short** circuit termination ($Z_L = 0$) (3%);
 - (c) Line terminated in $Z_L = 2Z_0$ (3%);
 - (d) Line terminated in $Z_L = (1/2)Z_0$ (3%);
 - (e) a **series R-L** circuit (3%);
 - (f) How can you detect an **interconnection failure** in IC packages using a TDR?
Draw graph to explain. (5%)

Hint:
$$\rho = \frac{E_r}{E_i} = \frac{Z_L - Z_0}{Z_L + Z_0}$$

5. Derive the series equivalent circuit of the inductor (i.e. L_3 & R_3) using
- (a) Hay bridge; (10%)
 - (b) Owen bridge. (10%)

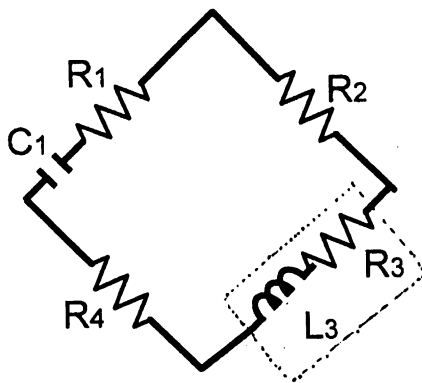


Fig 5a. Hay Bridge

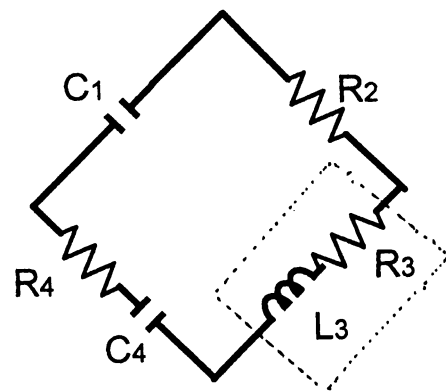


Fig 5a. Owen Bridge