※ 考生請注意：本試題可使用計算機，並限「考選部核定之國家考試電子計算器」機型

1. (a). **(6%)** Describe and explain the Resolution Bandwidth (RBW) and Video Bandwidth (VBW) in Superheterodyne Spectrum Analyzer.
   (b). **(6%)** Calculate the tilt angle if in-phase 120-Hz ac signals are applied to the deflection plates so that E_v is 35V and E_h is 15-V peak with the same amplitude scale in the X-Y mode of the Oscilloscope.

2. **(8%)** The output of a DC power supply falls from 20 V to 19. 83 V when the ac input drops by 10%. The output also falls from 20 V to 19.78 V when the load current goes from zero to its maximum level. Determine the line and load regulation.

3. (a). **(10%)** Please draw the block diagram of a frequency counter and explain it.
   (b). **(5%)** Find the period in seconds of a signal, if the DCA (Decimal Counting Assembly) count is 3535 and the time base frequency is 35 kHz.

4. Use the Hay Bridge to measure the unknown inductor *Lx* to find its equivalent resistance and inductance. The signal frequency is 200 Hz .The Hay bridge has R1=1.5 kΩ, R3=100 Ω R4=1 kΩ, and C3=0.05 mF, shown in **Fig.1**.
   (a). **(5%)** Is it proper to use the Hay Bridge to measure the *Lx*? Why?
   (b). **(5%)** Please transfer it to Maxwell's bridge and calculate *Ls*, *Rs*.
   (c). **(5%)** Determine the values of the *R1* and *R3* in Maxwell's bridge with given *C3*=0.05 mF, *R4*=1 KΩ and the same *Ls* value in (b).

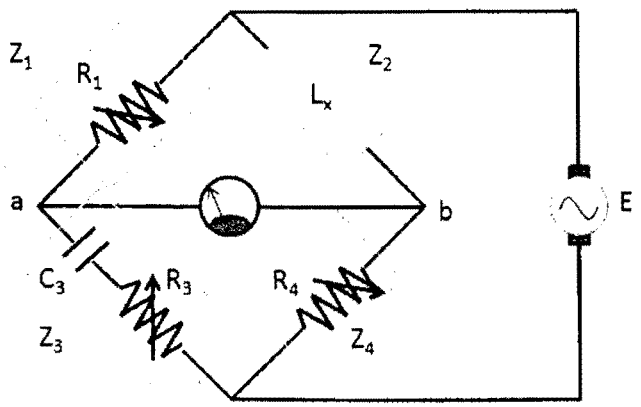

Fig.1

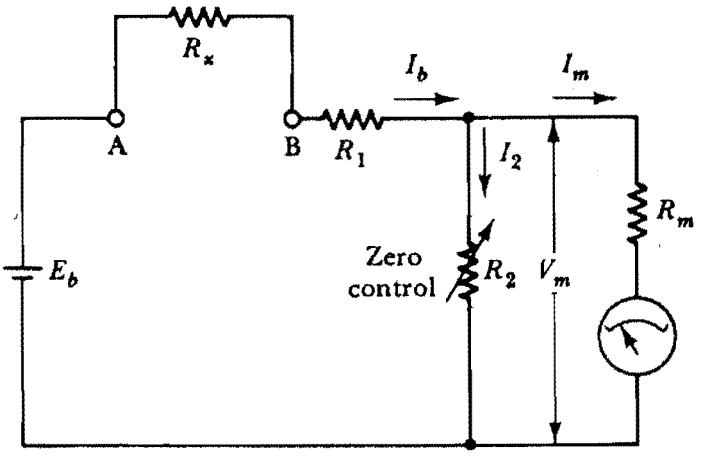

Fig. 2

5. A series ohmmeter (Fig. 2) that has a standard internal resistance of $R_1 = 50\,k\Omega$ uses a meter with FSD = 75 μA and $R_m = 100\,\Omega$. The meter shunt resistance is $R_2 = 300\,\Omega$, and the battery voltage is $E_b = 5V$.
   (a) **(10%)** Determine the resistance measured at 0, 25%, 50%, 75%, and 100% of full-scale deflection.
   (b) **(5%)** Determine the new resistance to which R_2 must be adjusted when E_b falls to **4 *V***.

(背面仍有題目,請繼續作答)

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6. (10%) Some components such as four-terminal resistor are used to reduce the loading effect in measurement instruments. Briefly explain the function of four-terminal resistor in an Ammeter. (Fig. 3)

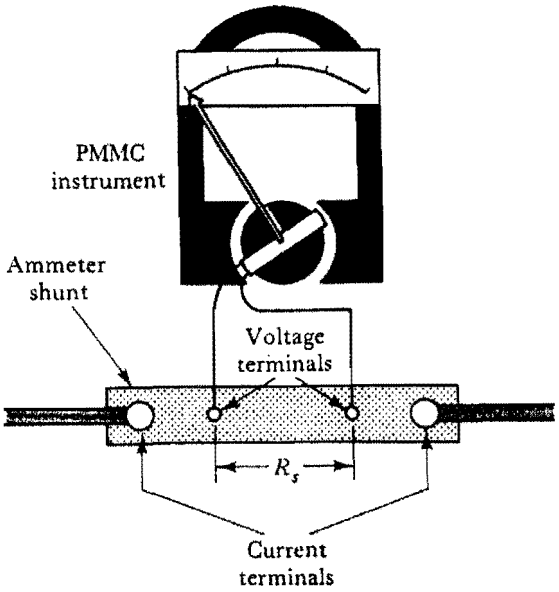


Fig. 3

7. **(15%)** Draw the patterns on the TDR (TIME-DOMAIN REFLECTOMETRY) for the circuits shown in Fig. 4.

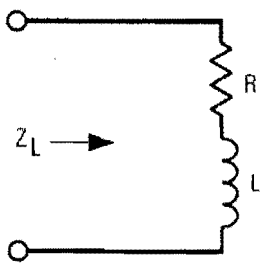
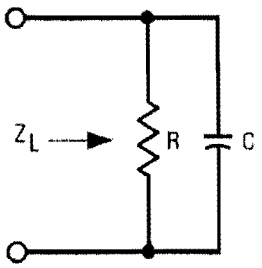
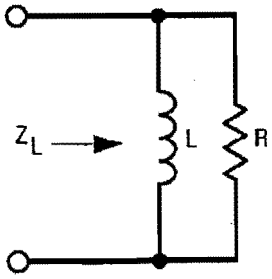


Fig. 4 (a)



(b)



(c)

8. **(10%)** Describe the **compensation** techniques for the impedance analyzer (IA) measurements? (Fig. 5)

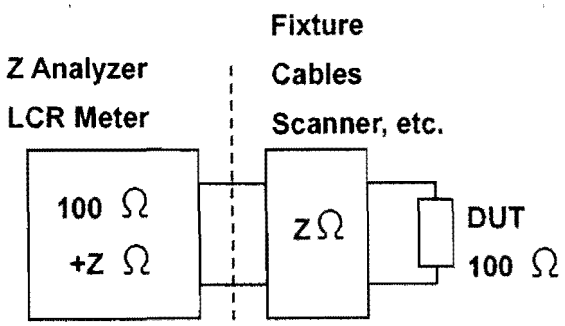


Fig. 5