1. **(10%)** Explain the terminologies: accuracy, precision, resolution, reliability and repeatability.
2. **(20%)** A cable is about 10 Km in length, and there is a ground fault shown in **Figure A**. The cable resistance is $10\,\Omega$ per 1 Km. The data measured by Varley loop are: $P = 4\,k\Omega$, $Q = 2\,k\Omega$, $S = 200\,\Omega$ when switch at point a; $S = 180\,\Omega$ when switch at point b. Find the location of ground fault.
3. **(20%)** The parameters in a Wheatstone bridge are: $P=2\,k\Omega$, $Q=1\ k\Omega$, $S=4\,k\Omega$, $E=12V$, minimum adjustable $\angle S=\pm 0.1\,\Omega$, $R_m=1\,k\Omega$, and $I_G(min)=0.1\,\mu A$. Find the value of R and the sensitivity or resolution of the Wheatstone bridge in **Figure B**.

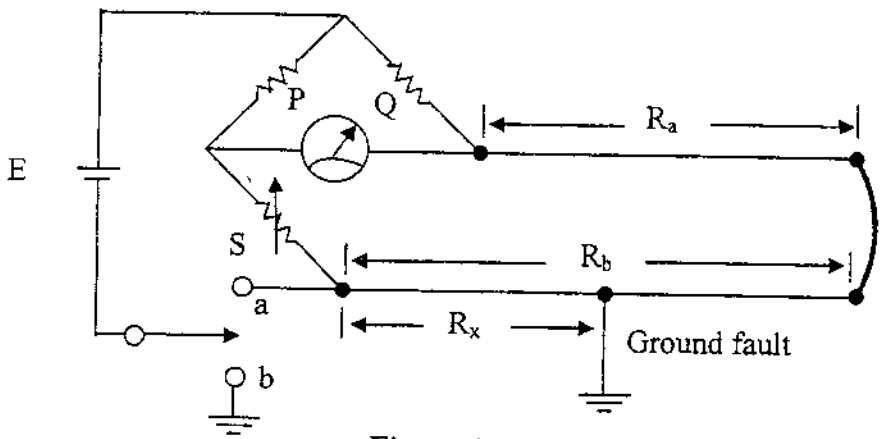

Figure A

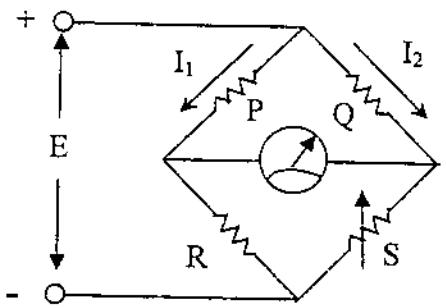

Figure B

4. **(20%)** (a) Define the Q factor for an inductor. Write the equations for inductor Q factor with RL series and parallel equivalent circuits. (b) Define the D factor for a capacitor. Write the equations for capacitor D factor with RC series and parallel equivalent circuits. (c) Explain the physical meaning of Q and D factors.

5. **(15%)** Sketch a typical ohmmeter (**Figure C**) scale, explain why the scale is ***nonlinear***, and explain which part of the scale gives the most accurate resistance measurement. (Hint: Assume that the PMMC meter has a 1% accuracy, $I_{FSD} = 100\ \mu A$, and $E_b = 1.5$ V, find the accuracy when the pointer is at 0.2FSD, 0.5FSD, and 0.8FSD. Assuming that ohmmeter uses precision internal resistors)

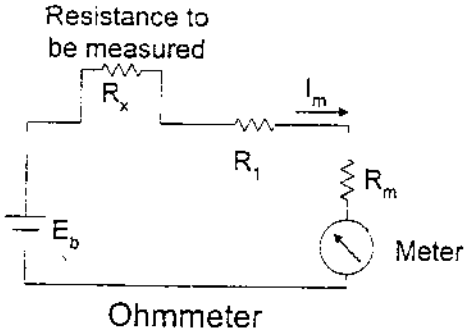

Figure C.

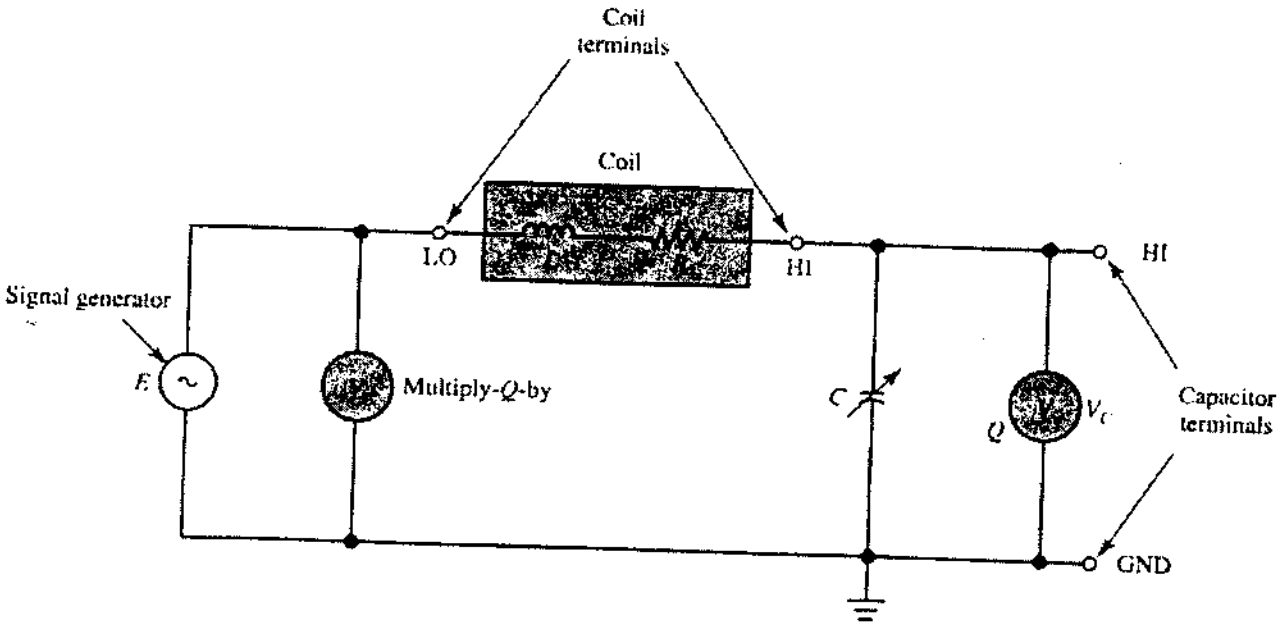

Figure D. A basic Q meter circuit.

6. **(15%)** With the signal generator frequency of a *Q meter* (**Figure D**) set to 1.25 MHz, the Q of a coil is measured as 98 when $C = 147\ pF$. Determine the coil inductance (L) and resistance (R).