(1) Data:

$n = 50$

$l = 5\text{cm} = 0.05\text{m}$

$b = 3\text{cm} = 0.03\text{m}$

$B = 0.050\ T$

$c = 1.5 \times 10^{-9}$ Nm/degree

$\theta = 30°$

Solution:

$A = lb$

$= 0.05 \times 0.03$

$= 0.0015\ m^2$

$\tau_{el.} = \tau_R$

$\therefore BInA = c\theta$

$0.050 \times I \times 50 \times 0.0015 = 1.5 \times 10^{-9} \times 30$

$\therefore I = \dfrac{1.5 \times 10^{-9} \times 30}{0.050 \times 50 \times 0.0015}$

$\therefore I = 1.2 \times 10^{-5}\ A$

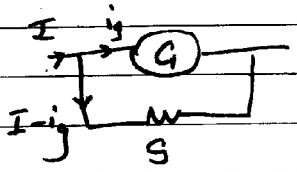
(2) Data:

$G = 40\ \Omega$

$i_g = 5 \times 10^{-3}\ A$

$S = ?$

$I = 5A$



$i_g \cdot G = (I - i_g) \cdot S$

$5 \times 10^{-3} \times 40 = (5 - 5 \times 10^{-3})\ S$

$\therefore S = 0.04\ \Omega$

$\therefore$ Connect a $0.04\ \Omega$ Resistance in parallel to the galvanometer.

(3) Data:

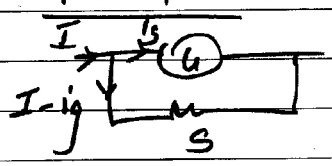
$G = 60\ \Omega$

$I = 5A$

$i_g = 50 \times 10^{-3}\ A$

$V = 50V$

For Ammeter:



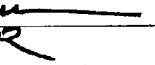
$G.i_g = (I - i_g) \cdot S$

$60 \times 50 \times 10^{-3} = (5 - 50 \times 10^{-3}) \cdot S$

$\therefore S = 0.6061\ \Omega$

Connect $0.6061\ \Omega$ in parallel

For Voltmeter:



$V = i_g G + i_g R$

$50 = 50 \times 10^{-3}(60 + R)$

$\therefore R = 940\ \Omega$ in series

(4) Data :

$G = 16\ \Omega$

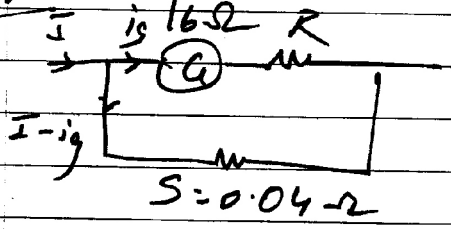
$i_g = 20 \times 10^{-3}\ A$

$S = 0.04\ \Omega$

$R = ?$

$I = 10\ A$

Solution :



$i_g(G+R) = (I-i_g)S$

$20 \times 10^{-3}(16+R) = (10 - 20 \times 10^{-3}) \times 0.04$

$16 + R = \frac{0.3992}{20 \times 10^{-3}}$

$\therefore R = 3.96\ \Omega$

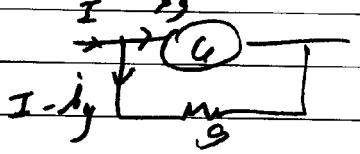
(5) Data :

$G = 297\ \Omega$

$S = 3\ \Omega$

$\frac{i_g}{I} = ?$

Solution :



$i_g G = (I - i_g) \cdot S$

Divide by I

$\frac{i_g}{I} \cdot G = \left(1 - \frac{i_g}{I}\right) \cdot S$

$\therefore \frac{i_g}{I}(G+S) = S$

$\frac{i_g}{I} = \frac{S}{G+S}$

$= \frac{3}{297+3}$

$= \frac{3}{300}$

$= \frac{1}{100}$

i.e. 1%

(6) $G = 1000\ \Omega$

$G // S = 25\ \Omega$

$S = ?$

Solution :

$G // S = \frac{GS}{G+S}$

$25 = \frac{1000S}{1000+S}$

$25000 + 25S = 1000S$

$25000 = 975S$

$\therefore S = 25.64\ \Omega$

(7) $n = 50$

$A = 12 \times 10^{-4} m^2$

$B = 0.025\ T$

$C = 15 \times 10^{-10}$ N m/degree

$$S = \frac{d\theta}{dI} = \frac{nBA}{C}$$

$$\therefore S = \frac{50 \times 0.025 \times 12 \times 10^{-4}}{15 \times 10^{-10}}$$

$$= 10^6 \text{ div/A}$$