QUES 01:-

. **Two moving coil meters, M_1 and M_2 have the following particulars:**

$R_1 = 10\Omega$, $N_1 = 30$,

$A_1 = 3.6 \times 10^{-3}\,\mathbf{m}^2$, $B_1 = 0.25\ T$

$R_2 = 14\Omega$, $N_2 = 42$,

$A_2 = 1.8 \times 10^{-3}\,\mathbf{m}^2$, $B_2 = 0.50\ T$

(The spring constants are identical for the two meters).

Determine the ratio of (a) current sensitivity and (b) voltage sensitivity of M_2 and M_1.

Ans. For moving coil meter M_1:

Resistance, $R_1 = 10\Omega$

Number of turns, $N_1 = 30$,

Area of cross-section, $A_1 = 3.6 \times 10^{-3}\,m^2$

Magnetic field strength, $B_1 = 0.25\ T$

Spring constant $K_1 = K$

For moving coil meter M_2:

Resistance, $R_2 = 14\Omega$

Number of turns, $N_2 = 42$,

Area of cross-section, $A_2 = 1.8 \times 10^{-3}\,m^2$

Magnetic field strength, $B_2 = 0.50\ T$

Spring constant, $K_2 = K$

(a) Current sensitivity of M_1 is given as:

$$I_{s1} = \frac{N_1 B_1 A_1}{K_1}$$

And, current sensitivity of M_2 is given as:

$$I_{s2} = \frac{N_2 B_2 A_2}{K_2}$$

$$\therefore \text{ Ratio } \frac{I_{s2}}{I_{s1}} = \frac{N_2 B_2 A_2 K_1}{K_2 N_1 B_1 A_1}$$

$$= \frac{42 \times 0.5 \times 1.8 \times 10^{-3} \times K}{K \times 30 \times 0.25 \times 3.6 \times 10^{-3}} = 1.4$$

Hence, the ratio of current sensitivity of M_2 *to* M_1 is 1.4.

(b) Voltage sensitivity for M_2 is given as:

$$V_{s2} = \frac{N_2 B_2 A_2}{K_2 R_2}$$

And, voltage sensitivity for M_1 is given as: