Chapter-3(The concepts of Volt-Meter multipliers)

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Introduction:

- The series resistance, which is used in DC voltmeter is also called series multiplier resistance or simply, multiplier. It basically limits the amount of current that flows through galvanometer in order to prevent the meter current from exceeding the full scale deflection value.

Volt-Meter Multipliers:

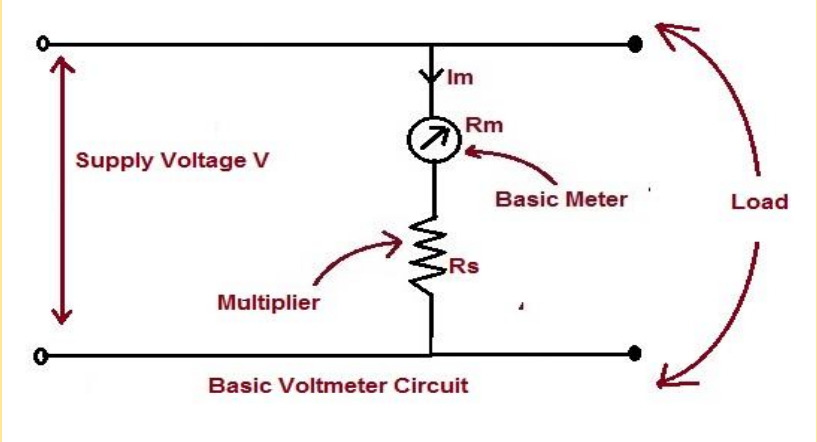
Rm = Internal resistance of the meter

Rs = Resistance of multiplier

Im = Full-scale deflection current of meter

V = Voltage being measured

Vm = Full deflection voltage of the meter



From the above figure,

The multiplying factor of the multiplier is the ratio of extended voltage range to be measured V to the actual sustainable voltage by the voltmeter Vm. If the sustainable voltage drop of the meter Vm = Im Rm. Then multiplying factor m is

$$m = \frac{V}{V_m} = \frac{I_m(R_m + R_s)}{I_m R_m}$$

$$m = 1 + \frac{R_s}{R_m}$$

$$R_s = (m-1)R_m$$

$$V = I_m(R_m + R_s)$$

$$V = I_m R_m + I_m R_s$$

$$I_m R_s = V - I_m R_m$$

$$\therefore R_s = \frac{V}{I_m} - R_m$$

Describe Swamping Resistance:

Moving coils used in PMMC instruments are made of thin copper wire, whose resistance changes significantly with temperature, resulting in an error in measurement. To **reduce temperature effect**, a swamping resistance is connected in series to a galvanometer, resulting in equivalent coil resistance as Rsw + Rc.