Electronic Instruments

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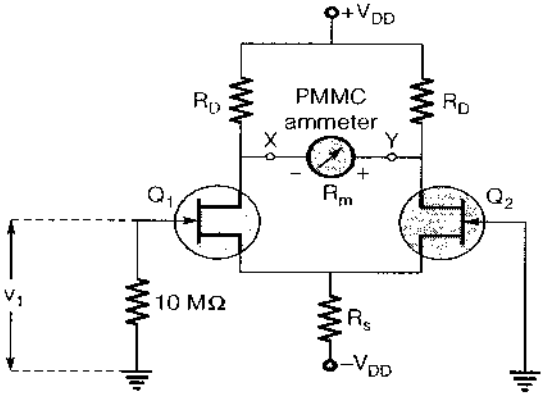
- Average current through diode vacuum tube voltmeters

$$I_{av} = \frac{E_{av}}{2R} = \frac{E_{rms}}{2 \times 1.11 \times R} = 0.45 \frac{E_{rms}}{R}$$

where, E_{rms} = RMS value of applied voltage
E_{av} = Average value of applied voltage
R = Load resistance

Difference amplifier type of electronic voltmeter



- Thevenin's voltage across terminal X-Y

$$V_{Th} = g_m \left(\frac{r_d R_D}{r_d + R_D} \right) v_1$$

- Thevenin's resistance looking into terminals X-Y

$$R_{Th} = \frac{2 r_d R_D}{r_d + R_D}$$

where, R_d = A.C. drain ressitance in Ω
g_m = Transconductance in mho

- Current through ammeter

$$i = \frac{V_{Th}}{R_{Th} + R_m} = \frac{g_m r_d R_D / (r_d + R_D)}{2r_d R_D / (r_d + R_D) + R_m} \cdot v_1$$

when $R_D << r_d$

$$i = \frac{g_m R_D}{2R_D + R_m} \cdot v_1$$

Digital Meters

Basic measurable quantity in digital meter is D.C.

1. Resolution (R) of Digital Meter

The smallest change in the input which a digital meter can be able to detect is called resolution.

$$R = \frac{1}{10^n}$$

where, n = Number of full digit.

2. Sensitivity (S)

The smallest change in input that can be displayed within given range.

$$S = \text{Resolution} \times \text{Range of meter}$$

3. Over ranging

Switch on the extra half (1/2) is called over ranging. Due to this over ranging the range of the instrument increases.

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