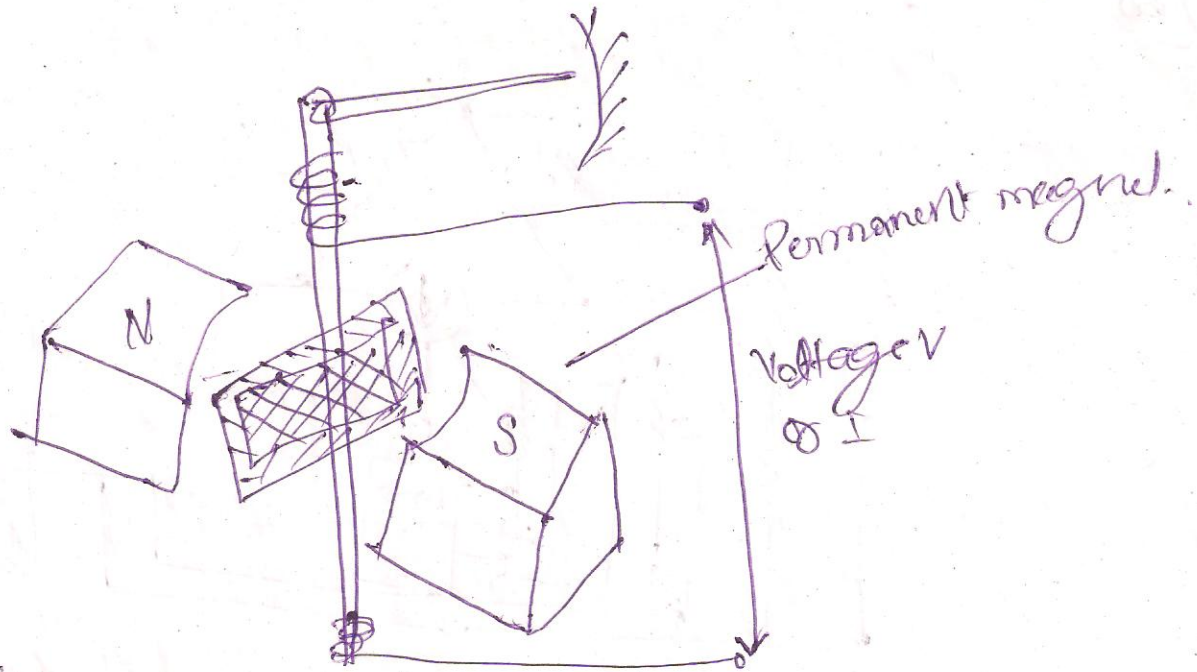
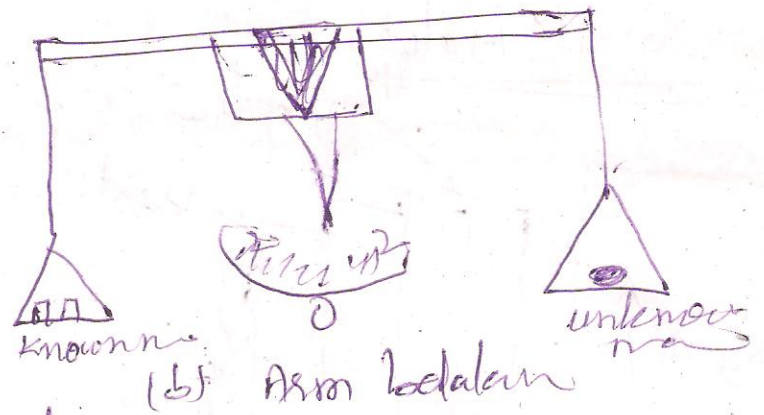
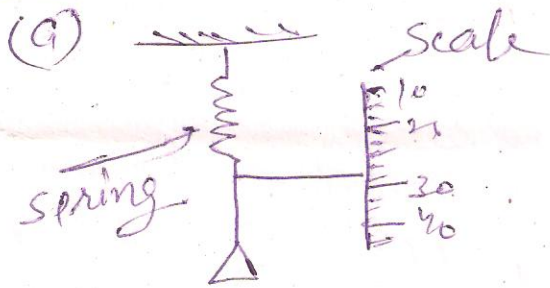


Fig.

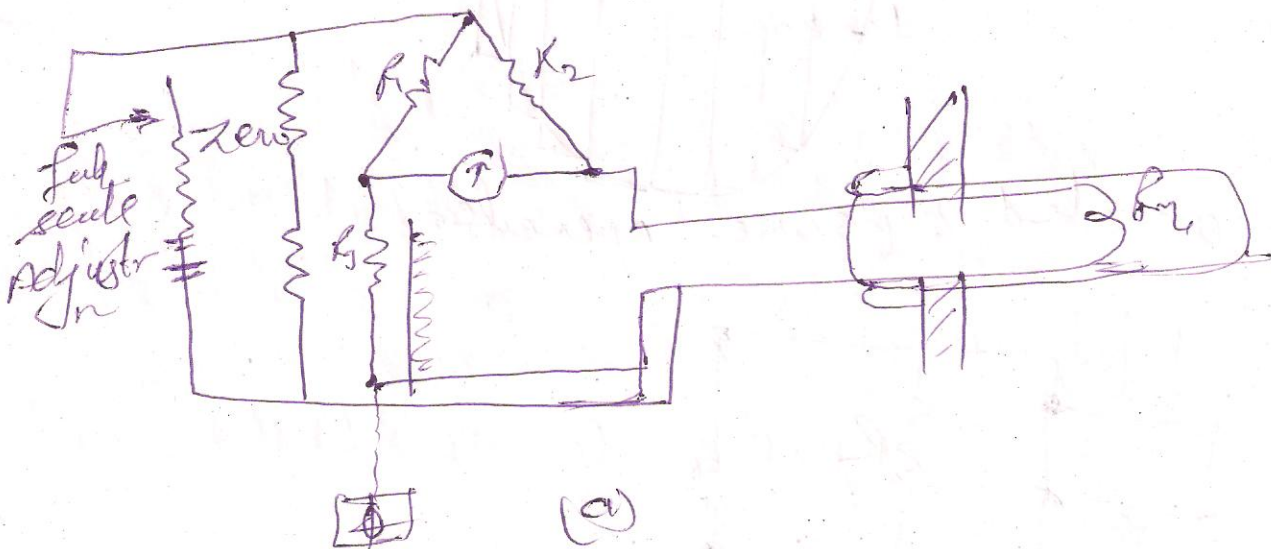


* classification of measuring Instruments :-

(1) Deflection & Null type :-

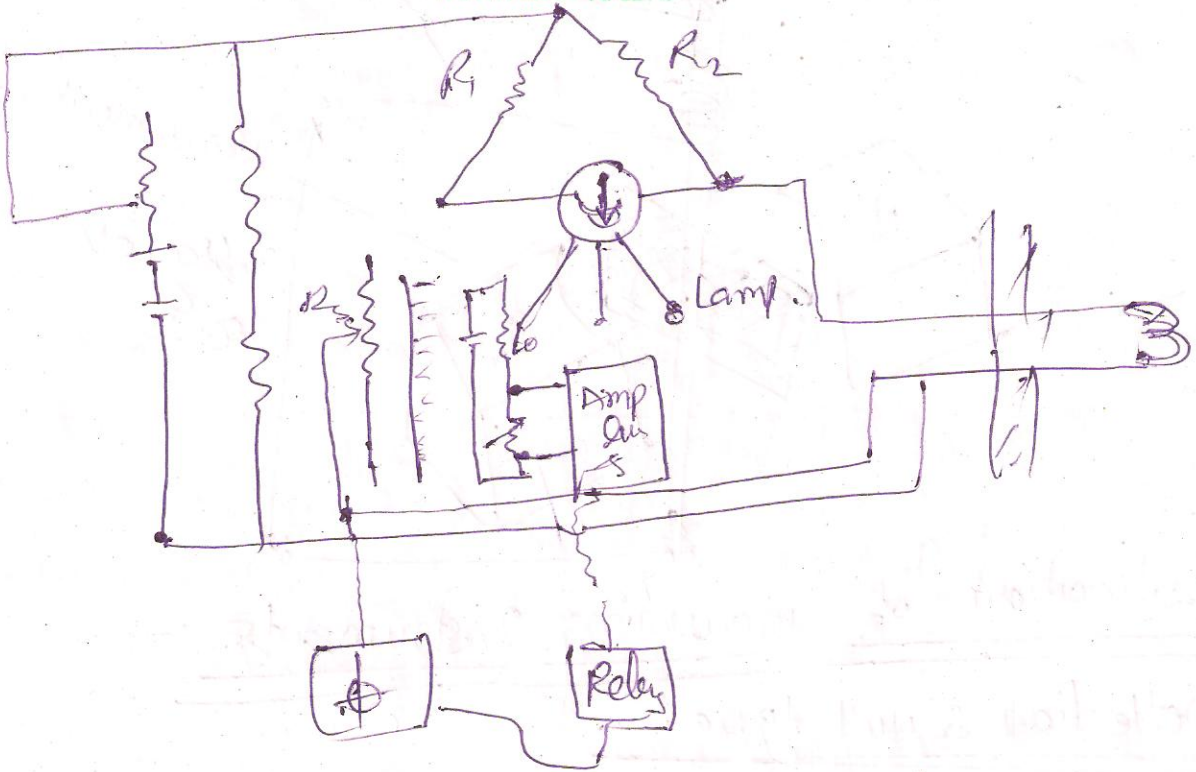


(b) manually operated & Automatic

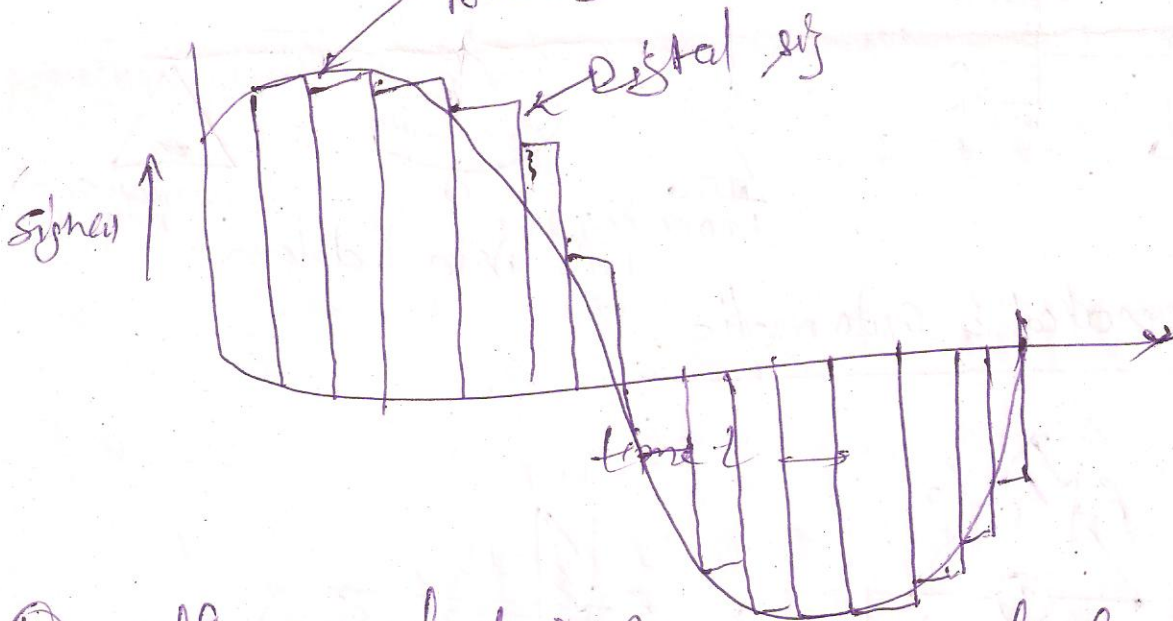


(b) Automatic

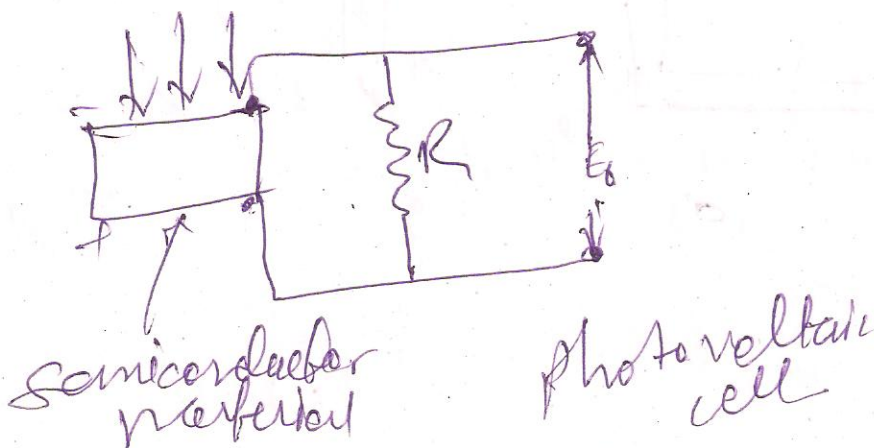
उत्तर रेलवे
NORTHERN RAILWAY



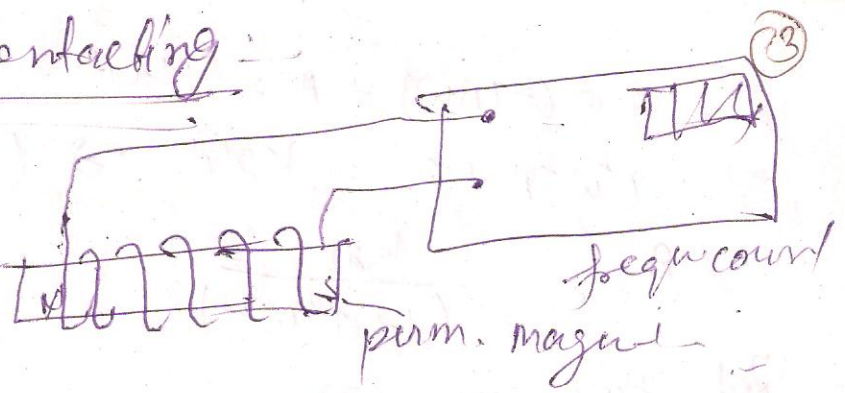
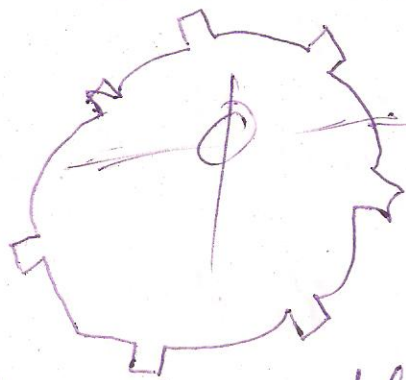
3. Digital & Analog :-



(4) self generated & power operated



⑤ contacting & non-contacting :-



⑥ Dumb & Intelligence type :-

* Dynamic Response of 1st order system :-

The governing equation for first order is

$$a_1 \frac{dx_0}{dt} + a_0 x_0 = b_0 x_i(t)$$

Divide by a_0 both sides,

$$\frac{a_1}{a_0} \dot{x}_0 + x_0 = \frac{b_0}{a_0} x_i(t)$$

$$(TD+1)x_0 = K x_i(t) \quad \text{--- (1)}$$

where x_0 and x_i are output & input resp.

put $x_i = x_i \sin \omega t$

& $x_0 = A \sin \omega t + B \cos \omega t$ --- (2)

$$(TD+1)(A \sin \omega t + B \cos \omega t) = K x_i \sin \omega t \quad \text{--- (3)}$$

$$TD[A \sin \omega t + B \cos \omega t] + (A \sin \omega t + B \cos \omega t) = K x_i \sin \omega t$$

$$T[A \omega \cos \omega t - B \omega \sin \omega t] + (A \sin \omega t + B \cos \omega t) = K x_i \sin \omega t$$

comparing coefficients of $\sin \omega t$ & $\cos \omega t$ both sides

$$TA \omega + B = 0 \quad \text{--- (a)}$$

$$-TB \omega + A = K x_i \quad \text{--- (b)}$$

from (a) $B = -TA \omega$ put this in (b) we get