

- Measurement of Weight and Force:-

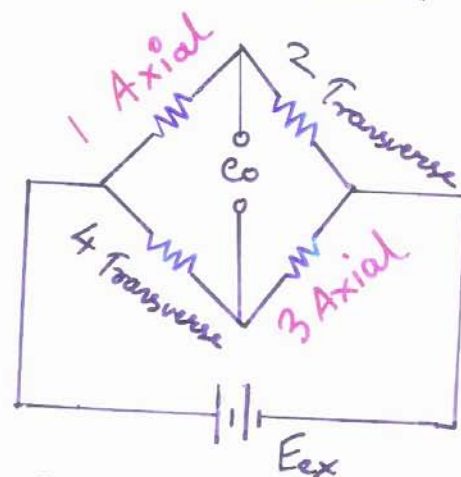
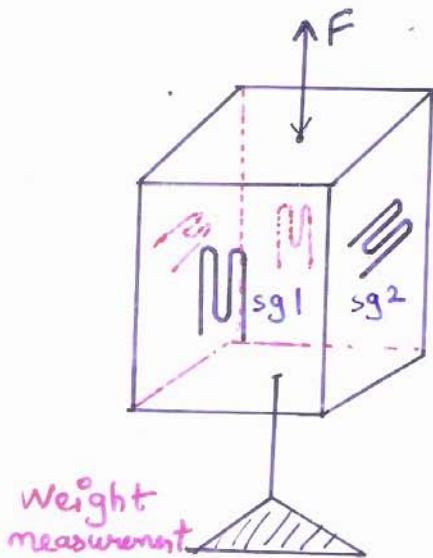
$$\text{Force} = \text{Mass} \times \text{Acceleration}$$

$$\text{Weight} = \text{Mass} \times \text{Acceleration due to gravity.}$$

↳ LOAD CELL (Weight - Measuring Sensor)

- Types
  - ↳ Column type load cell
  - ↳ Cantilever beam type Load cell.

↳ Force measurement by Column type Load Cell:-



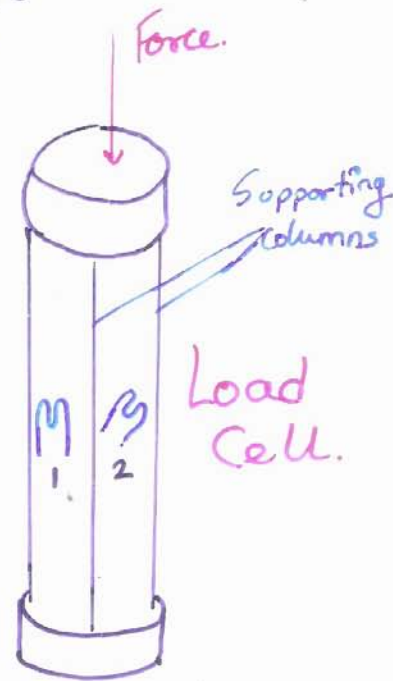
Signal Conditioning ckt for Load Cell.

Strain Gauges  $\Rightarrow$  Due to Application of stress, there will change in Resistance of strain gauge.

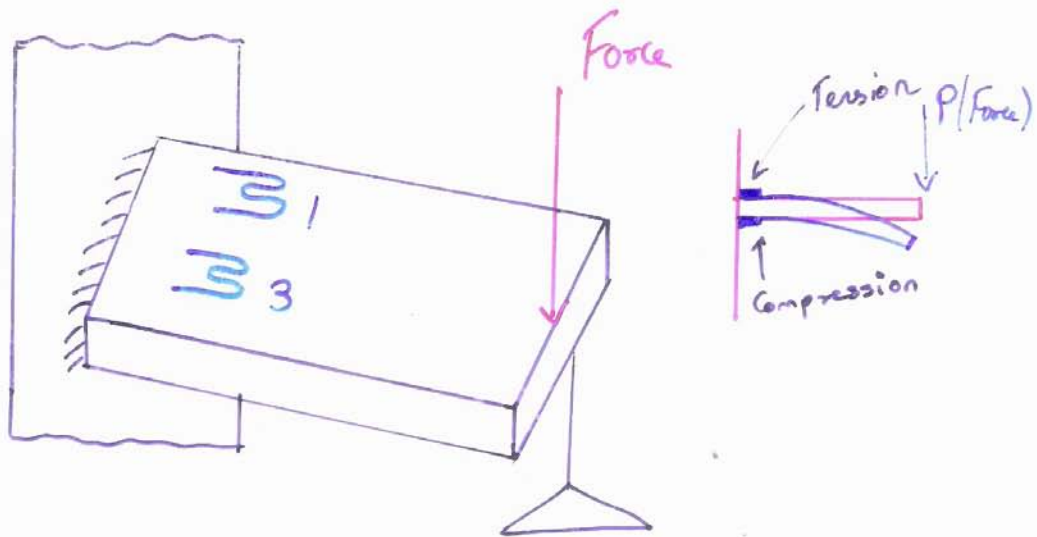
- Installing strain gauges is important (Orientation)

## Column type load Cell:-

1. When a force (load) to be measured is applied to supporting column, stress is transferred to strain gauges attached to it.
2. Due to the orientation of strain gauges in axial direction (1 & 3) and transverse (2 & 4), there will be tensile and compressive strain developed in strain gauges.
3. When column is under stress, sg 2 & sg 4 will undergo tensile strain & length ↑ i.e. their resistances ↑.
4. All strain gauges will be placed in 4 arms of wheatstone bridge, where change in resistances i.e.  $(R + \Delta R)$  or  $(R - \Delta R)$  will be converted to Bridge O/P  $E_0$ .
5. This O/P vty of bridge is such that it is directly proportional to force (load) applied to column.



→ Cantilever beam type load cell:-



- Here, orientation of all strain gauges are in axial direction
- Strain gauges (1) & (3) are at top. while (2) & (4) are at bottom.
- Strain gauges (1) & (3) will undergo  $\Rightarrow$  Tensile strain (Elongation)
- Strain gauges (2) & (4) will undergo  $\Rightarrow$  Compressive strain.
- Four strain gauges are then placed in 4 arms of wheatstone's bridge to get Electrical OP Proportional to load applied.