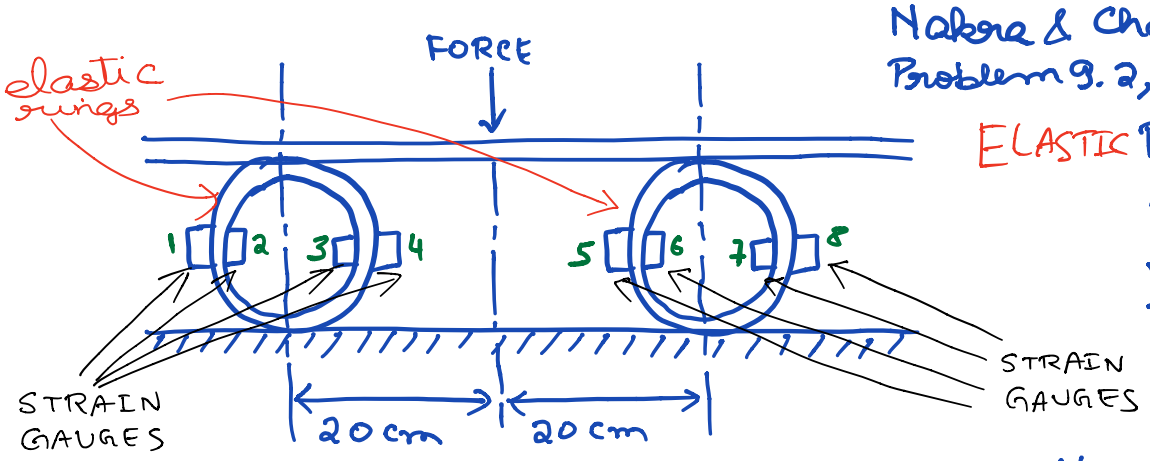
Nakra & Chaudhry
Problem 9.2, Pg 235



ELASTIC RING

Radius = 30 mm
Width = 15 mm
Thickness = 2 mm

Young's modulus,
$E = 2.1 \times 10^5$ N/mm^2

$R = 120\,\Omega$, gauge factor = 2.

Battery voltage for bridge = 9V

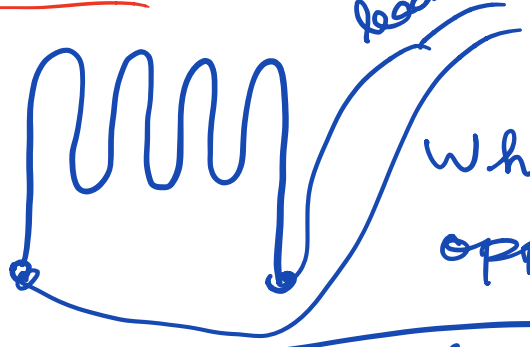
$R_G = 1000\,\Omega$

MINOR TEST 2
26.03.2019, TUE
1 – 2 PM, LH114

Sketch the bridge arrangement to give temperature compensation + high sensitivity & Find the value of the force applied corresponding to a bridge output of 1.6 mV. [additional relation to connect the force F, with strains in the elastic rings]

ELL301

19.03.2019



- Why this structure?, as opposed to this?

because $\frac{\Delta R/R}{\Delta L/L}$ is gauge factor: fixed material

- We want large enough resistance so that stray resistance of leads etc don't dominate.

- Of course, we can have a long strain gauge 

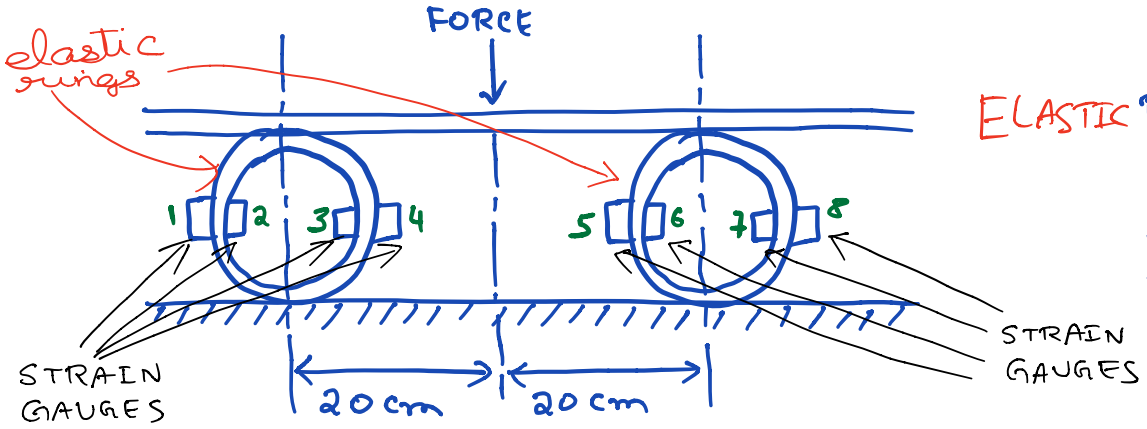
  This has problems that
  - variations of strain across length
  - difficulty to connect to external circuit
  - doesn't measure strain at a point or locally.

- Therefore, we make 

- What should be the dimensions of the "wire"?

  $R = \rho \frac{l}{A}$ → l should be large

  A → should be small.



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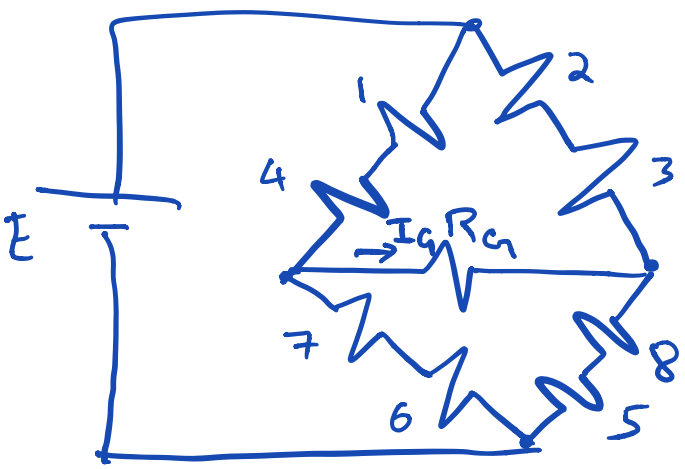
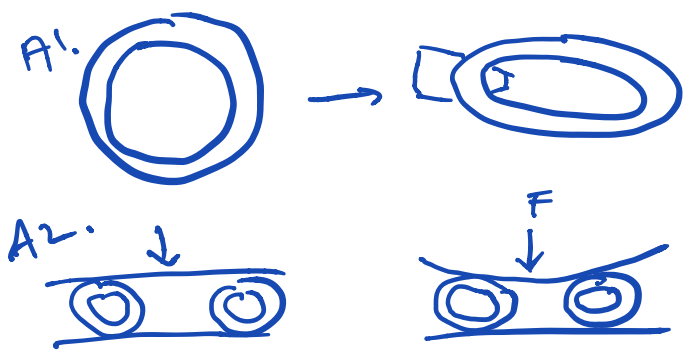
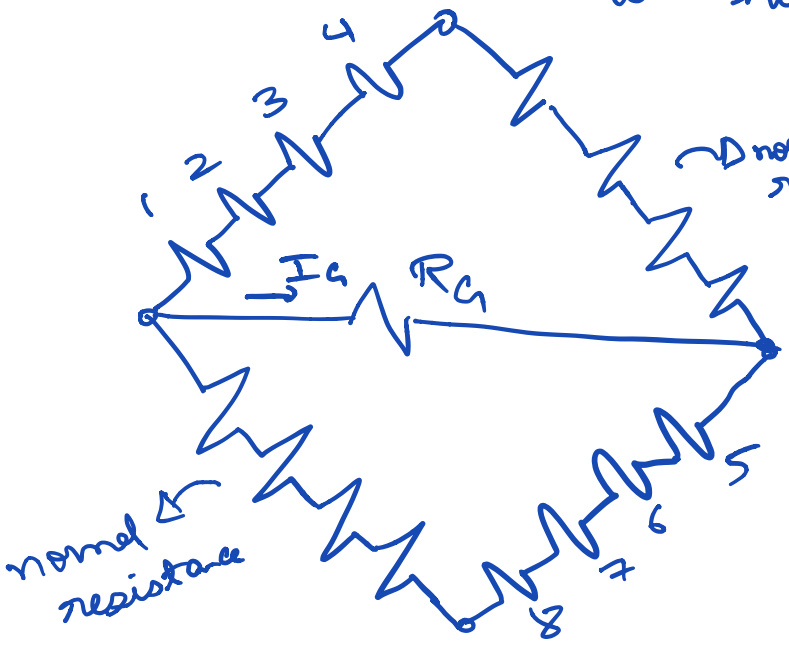




Problem with above: Strains of {1,2} and similar will have a cancellation effect.



↳ normal resistance

↳ if these can be put close to 1,2,3,4, then some temperature compensation can happen.

⇒ 16 strain Gauges

These are possible arrangements.

How is I_G related to $E, R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8$?

We are given $I_G R_G$ and R_G ⇒ So we can find out the force?