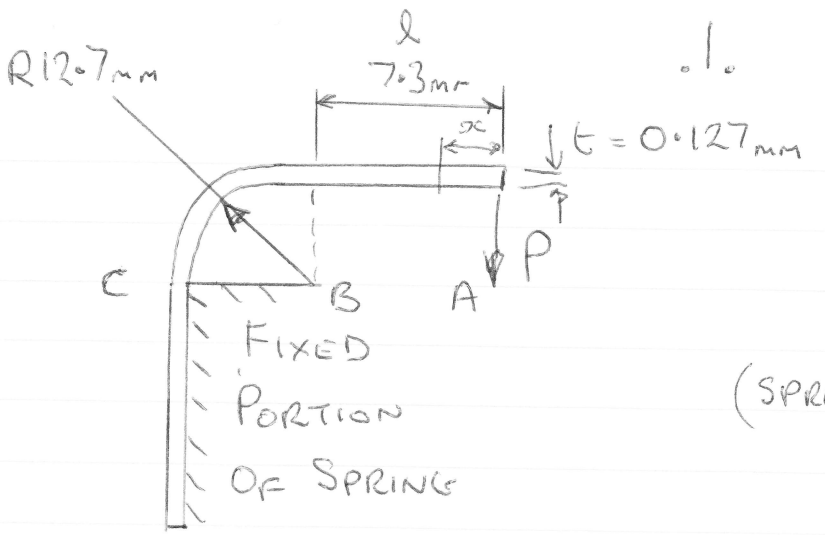

$P = 0.49N = 50g$

$t = 0.127mm$

(SPRING WIDTH) $b = 14.478\ mm$

CALCULATE THE DEFLECTION USING STRAIN ENERGY

FOR LENGTH AB

$M = Px$

$$U_{AB} = \frac{1}{2EI}\int_0^l (Px)^2$$

$$U_{AB} = \frac{P^2 l^3}{6EI}$$

FOR QUARTER CIRCLE BC

$M = P(l + r\sin\theta)$

$$U_{BC} = \frac{1}{2EI}\int_0^{\frac{\pi}{2}} P^2(l + r\sin\theta)^2$$

$$U_{BC} = \frac{P^2 r}{2EI} \times \left[\frac{\pi l^2}{2} + 2lr + \frac{\pi r^2}{4}\right]$$

TOTAL STRAIN ENERGY = $U_{AB} + U_{BC}$

$$\therefore U_{TOT} = \frac{P^2 l^3}{6EI} + \frac{P^2 r}{2EI}\left[\frac{\pi l^2}{2} + 2lr + \frac{\pi r^2}{A}\right]$$

$$\frac{1.556716362 \times 10^{-8}}{EI} + \frac{6.034575555 \times 10^{-7}}{EI}$$

$$U_{TOT.} = 1.252389757 \times 10^{-3} \text{ J}$$

NOW EQUATE ENERGY TO STIFFNESS

$$\frac{1}{2} P y = 1.252389757 \times 10^{-3}$$

$$\therefore y_{deflection} = \frac{2 \times 1.252389757 \times 10^{-3}}{0.49N}$$

$$\underline{y = 5.111795 \text{ mm}}$$

$$\text{STRESS } \sigma = \frac{My}{I} = \frac{20\text{mm} \times 0.49 \times \frac{.127}{2}}{\frac{.014478 \times .127^3}{12}}$$

$$\sigma = 251.8 \text{ N/mm}^2 \text{ (SPRING WILL HAVE YIELDED)}$$