# Problems

1) The load distribution b/w the front and Rear axle of the motor vehicle weighting 1350 kg is that 48 %. of the total load is taken by the front axle. The width of the track is 140cm and the distance b/w the Centers of the Spring pad is 66 cm. Design a Suitable. I Section for the front axle. Assuming that the width of the flange and its thickness are 0.6 and 0.2 of the overall depth of the Section respectively. The thickness of the web 0.25 of the width of the flange. Assuming a working Stress of 915 $Kgf/cm^2$

## Given data

Total Vehicle load = 1350 kgs

Front axle load = 48% of total load

Track width = 140 cm

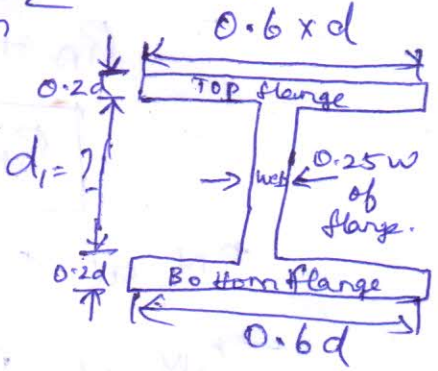
Distance between Springs = 66 cm

width of the flange = 0.6 of the overall depth.

Thickness of the flange = 0.2 of the overall depth

Thickness of web = 0.25 of the width of the flange

Working stress = 915 kgf/cm$^2$




~~To find~~: To design:

I Section

## Solution

Load shared by front axle = 48% of total load

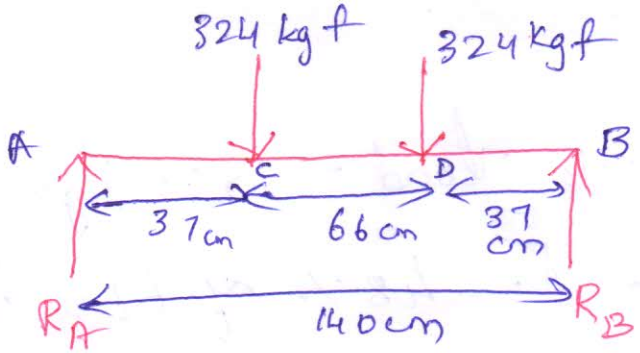
= 0.48 × 1350

= 648.

Since the load is given to front axle by 2 springs so

$$\frac{648}{2}$$

Load shared by front axle = 324 kg




Taking moment about $R_A$

$(R_B \times 140) = (324 \times 103) + (324 \times 37)$

$140\ R_B = 45360$

$$R_B = 324 \text{ kgf}$$

$\Sigma V = 0$

$R_A + R_B = 324 + 324$

$R_A + 324 = 648$

$$R_A = 324 \text{ kgf}$$

BM at B = 0

BM at D = $(324 \times 37)$

$= 11988$ kgf-cm

BM at C = $(324 \times 103) + (-324 \times 66)$

$= 11988$ Kgf-cm

BM at A = 0

Unit 4/5

From Bending moment equation

$$\frac{M}{I} = \frac{f}{y}$$

$b = 0.6d$

$t = 0.2d$.

$d_1 = d - 0.4d$

$$I = \frac{1}{12}(bd^3 - (b-t) \times d_1^3)$$

$$= \frac{1}{12}(0.6d \times d^3 - (0.6d - 0.2d) \times d_1^3)$$

$$= \frac{1}{12}(0.6d^4 - 0.4d \times d_1^3)$$

$$= \frac{1}{12}(0.6d^4 - [0.4d \times (d - 0.4d)^3]$$

$$= \frac{1}{12}(0.6d^4 - [0.4d \times (0.6d)^3]$$

$$= \frac{1}{12}(0.6d^4 - \overset{0.0864}{\cancel{0.216}}d^4)$$

$$I = \frac{1}{12}(0.5136\, d^4)$$

$$\boxed{I = 0.0428\, d^4}$$

$$\frac{M}{I} = \frac{f}{y}$$

$$\frac{11988}{0.0428d^4} = \frac{915}{d/2}$$

$$\boxed{d = 5.35 \text{ cm}}$$

$$b = 0.6d = 0.6 \times 5.35 = 3.2\text{cm}$$

$$t = 0.2d = 0.2 \times 5.35 = 1.07\text{cm}$$

$$t_w = 0.25 \times 0.6 \times 5.35$$

$$= 0.8025\text{cm}$$

$$d_1 = d - (t + t)$$

$$= 5.35 - (1.07 + 1.07)$$

$$\boxed{d_1 = 3.21\text{cm}}$$

Result: