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General Physics I, Quiz 2
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Quiz-2 Solution

1. Solution : ***(Similar to problem No.2 &7, Chap.12, text book 9th edition)***

(a)We can defind the center of gravity for X Ycoordinate as

$$X_{CG}=\frac{\sum m_i x_i}{\sum m_i} \text{ and } Y_{CG}=\frac{\sum m_i y_i}{\sum m_i}$$

In our case , we can write

$$X_{CG}=\frac{\sum m_i x_i}{\sum m_i}=\frac{MX+mx}{M+m}=\frac{60\times 4+40\times 5}{60+40}=\frac{440}{100}=4.4m$$

and

$$Y_{CG}=\frac{\sum m_i y_i}{\sum m_i}=\frac{MY+my}{M+m}=\frac{60\times(-2)+40\times 2}{60+40}=-\frac{40}{100}=0.4m$$

(b) Here we need to find out X and Y

Now we have,

$$X_{CG}=\frac{\sum m_i x_i}{\sum m_i}=\frac{MX+mx}{M+m}=4m \text{ (Given in question)}$$

$$So, 4m=\frac{MX+mx}{M+m}=\frac{60\times X+40\times 5}{60+40} \text{ (Since x = 5 m is fixed)}$$

$$X=\frac{400-200}{60}=\frac{200}{60}=3.3m$$

Similarly

$$Y_{CG}=\frac{60\times Y+40\times 2}{60+40}=0.4m$$

$$Y=\frac{40-80}{60}=-0.3m$$

So M has to move 3.3 m in (+ve) x-direction and 0.3 m (-ve) to get balance on the beam .

2. Solution: ***(Similar to problem No39, Chap.12, text book 9th edition)***

(a) Stress = The force applied per unit area on a object $=\frac{F}{A}$, where A= Area

$$\text{Strain} = \frac{\text{Change of physicsl dimention of an object by the applied force}}{\text{Initial dimention}}$$

$$\text{Example, Shear Strain} = \frac{\Delta l}{L} = \frac{\text{Change of lengh of an object by the applied force}}{\text{Initial length}}$$

(b) By definition we know the Young's Modulus is

$$Y = \frac{\frac{F}{A}}{\frac{\Delta l}{L}} = \frac{\frac{mg}{A}}{\frac{\Delta l}{L}} = \frac{\frac{100\times 10}{0.5\times 10^{-4}}}{\frac{0.5}{0.5}} = 2\times 10^{7}\, N/m^{2},$$ Where L=0.5 m and $\Delta l = 1m - 0.5m = 0.5m$