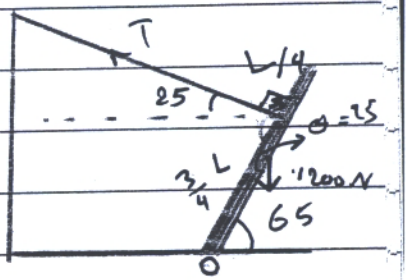
CH 13

Q.1

$\tau_{net} = 0$ (with respect to O)



$T\left(\frac{3}{4}L\right)\sin 90 - 1200\left(\frac{L}{2}\right)\sin 25 = 0$

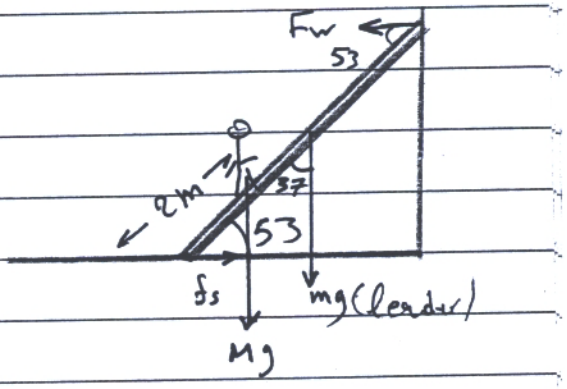
$T\left(\frac{3}{4}L\right) = 1200\,\frac{L}{2}\sin 25$

$T = 338\ N$

Q.2

$F_{net}(x) = 0 \Rightarrow$

$F_w = f_s$



$\tau_{net\,(Pin)} = 0 \Rightarrow$

$F_w(5)(\sin 53) - (mg)(2.5)\sin(37) - (Mg)(2)\sin 37 = 0$

$\Rightarrow F_w(4) = (20\times 9.8\times 2.5\times \sin 37) + (40\times 9.8\times 2\times \sin 37)$

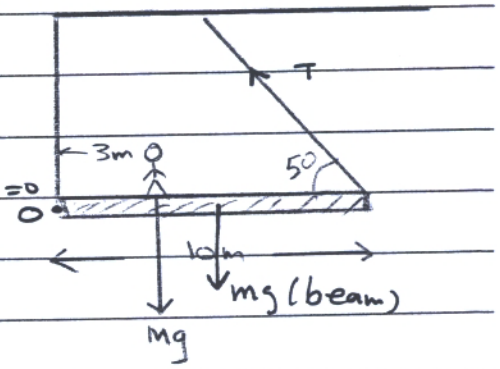
$\Rightarrow F_w = 192\ N \Rightarrow f_s = 192\ N$

Q3

$\tau_{net} = 0$ (with respect to O)

$T(10)\sin 50 - 25(5)\sin 90 - 60\times 9.8\times 3 = 0$ (25 × 9.8)

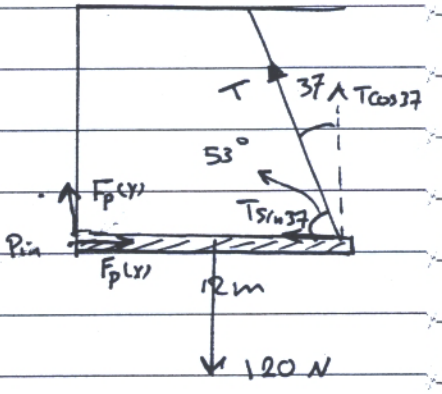
$\Rightarrow T = 390\ N$



Cont ch.13 →

Cont. ch 13

Q.4



$\Sigma F_x = 0$

$F_{p(x)} = T \sin 37$ — (1)

$\Sigma F_y = 0$

$F_{p(y)} + T \cos 37 = 120$ — (2)

$\Sigma T_{net}(0) = 0$ (pin is center of Rotation).

$T(12)\sin 53 - 120(6) = 0 \Rightarrow$

$T = 75\ N$

from (1): $F_{p(x)} = (75)\sin 37$

$(F_{p(x)} = 45\ N)$

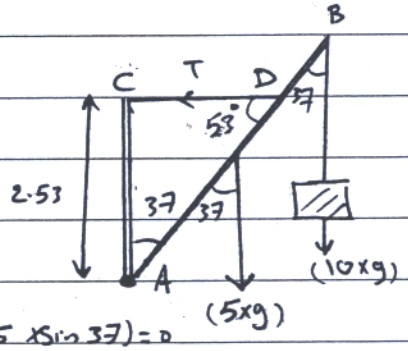
from (2): $F_{p(y)} = 120 - (75\cos 37) = 60$

$(F_{p(y)} = 60\ N)$

$\therefore F_{pin} = \sqrt{F_{p(x)}^2 + F_{p(y)}^2} = \sqrt{(45)^2 + (60)^2}$

$\underline{(F_{pin} = 75\ N)}$

Q.5 $\Sigma T_{net}(A) = 0$ (with respect to A)



$T(2.53) - (5 \times 9.8 \times 2.25 \times \sin 37) - (10 \times 9.8 \times 4.5 \times \sin 37) = 0$

$T = 131\ N$

Q.6 $\frac{F}{A} = E\frac{\Delta L}{L} \Rightarrow \Delta L = \frac{F}{A} \times \frac{L}{E} = \frac{(300 \times 9.8) \times 0.43}{(\pi \times (2 \times 10^{-3})^2) \times (2 \times 10^{11})}$

$\Delta L = 5 \times 10^{-4}\ m \Rightarrow \Delta L = 0.5mm$

Cont. → Ch3

Cont. CH 13

Q.7 $P = B \frac{\Delta V}{V}$

$V_1 = (0.855)^3 = 0.625\ m^3$

$V_2 = (0.85)^3 = 0.614\ m^3$

$|\Delta V| = 0.01087\ m^3$

$\therefore P = 1.4 \times 10^{11} \frac{0.01087}{0.625}$

$(P = 2.44 \times 10^9\ N/m^2.)$

Q.8 $\frac{F}{A} = E \frac{\Delta L}{L}$

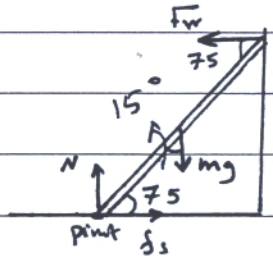
$F = EA \frac{\Delta L}{L}$, $r = 1\ mm = 1 \times 10^{-3}\ m$

$A = \pi r^2 = (3.14)(1 \times 10^{-3})^2$

$= 1.1 \times 10^{11} \times \frac{3.14 \times 10^{-6}}{1} \times 0.01$

$(F = 3459\ N)$

Q.9 first we have to find $f_s = ?$



$F_{net}(x) = 0 \Rightarrow F_w = f_s$ ... (1)

$F_{net}(y) = 0 \Rightarrow N = mg$ ... (2)

$\tau_{net} = 0$ (with respect to the pin)!!

$F_w (l) \sin 75 - mg(\frac{l}{2}) \sin 15 = 0$

$\Rightarrow F_w = (0.13\ mg)$, $(N = mg)$

$\therefore f_s = (0.13\ mg) = N \mu_s \Rightarrow \mu_s = 0.13$

END. Ch 13