E36 Spring 2005
Homework 4 Solutions
3/9,12,24,64,76

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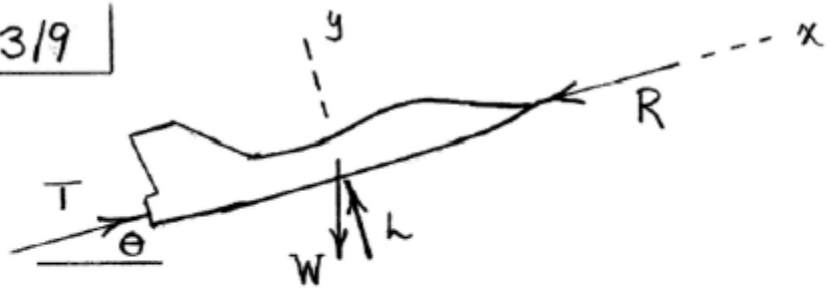

$$\Sigma F_x = 0: \quad T - R - W\sin\theta = 0$$

$$n = \frac{T-R}{W} = \underline{\sin\theta}$$

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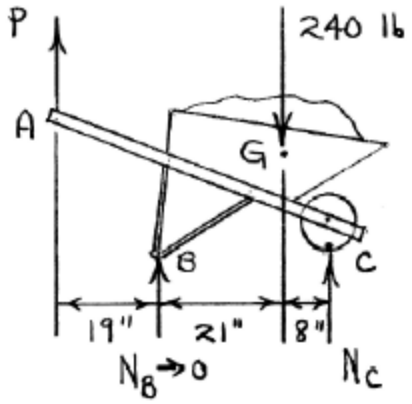

$$\circlearrowleft \Sigma M_C = 0: \quad P(48) - 240(8) = 0$$

$$\underline{P = 40 \text{ lb}}$$

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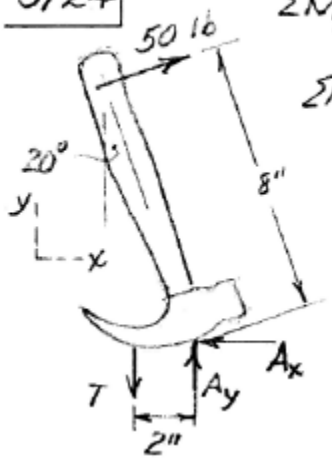

$\Sigma M_A = 0;\ 50(8) - 2T = 0,\ T = 200$ lb

$\Sigma F_x = 0;\ 50\cos 20° - A_x = 0$

$A_x = 46.98$ lb

$\Sigma F_y = 0;\ A_y + 50\sin 20° - 200 = 0$

$A_y = 182.9$ lb

$A = \sqrt{(46.98)^2 + (182.9)^2} = 188.8$ lb

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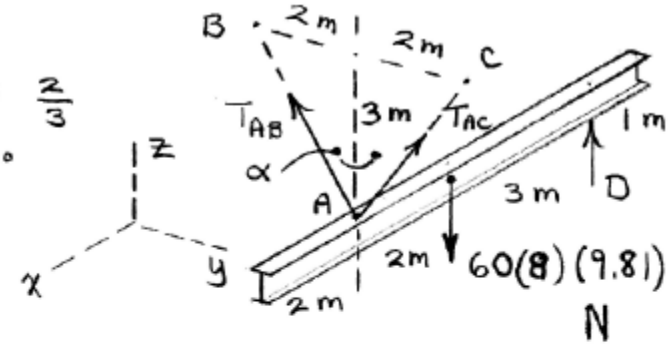
$\alpha = \tan^{-1}\frac{2}{3}$

$= 33.7°$



From $\Sigma F_y = 0$, $T_{AB} = T_{AC} = T$

$\Sigma M_{A_y} = 0: \quad -60(8)(9.81)(2) + D(5) = 0$

$D = 1884$ N

$\Sigma F_z = 0: \quad 2T\cos\alpha + D - 60(8)(9.81) = 0$

$T = 1698$ N $= T_{AB} = T_{AC}$

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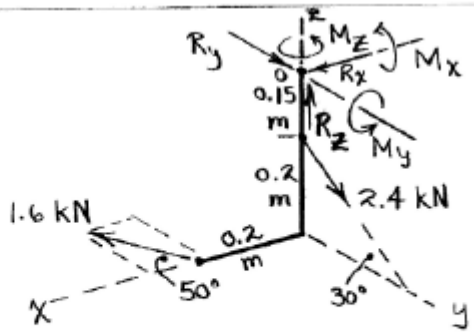

$\Sigma F_x = 0$: $R_x + 1.6 \cos 50°$, $\quad R_x = -1.028$ kN

$\Sigma F_y = 0$: $R_y + 2.4 \cos 30° - 1.6 \sin 50° = 0$, $\quad R_y = -0.853$ kN

$\Sigma F_z = 0$: $R_z - 2.4 \sin 30° = 0$, $\quad R_z = 1.2$ kN

$R = \sqrt{R_x^2 + R_y^2 + R_z^2} = \underline{1.796 \text{ kN}}$

$\Sigma M_{Ox} = 0$: $M_x + 2.4 \cos 30° (0.15) - 1.6 \sin 50° (0.35) = 0$

$M_x = 0.1172$ kN·m

$\Sigma M_{Oy} = 0$: $M_y - 1.6 \cos 50° (0.35) = 0$, $\quad M_y = 0.360$ kN·m

$\Sigma M_{Oz} = 0$: $M_z - 1.6 \sin 50° (0.2) = 0$, $\quad M_z = 0.245$ kN·m

$M = \sqrt{M_x^2 + M_y^2 + M_z^2} = \underline{0.451 \text{ kN·m}}$