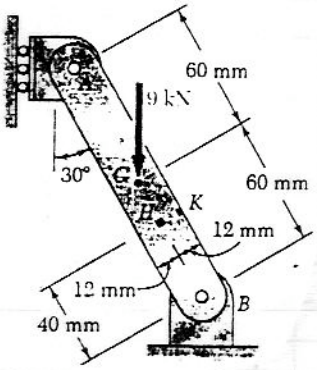
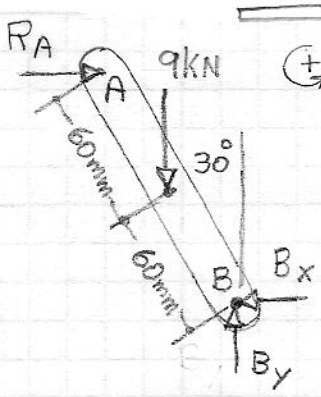
Problem 8.34

8.34 and 8.35 Member AB has a uniform rectangular cross section of 10 × 24 mm. For the loading shown, determine the normal and shearing stresses (*a*) point H. (*b*) point K.



Overall FBD



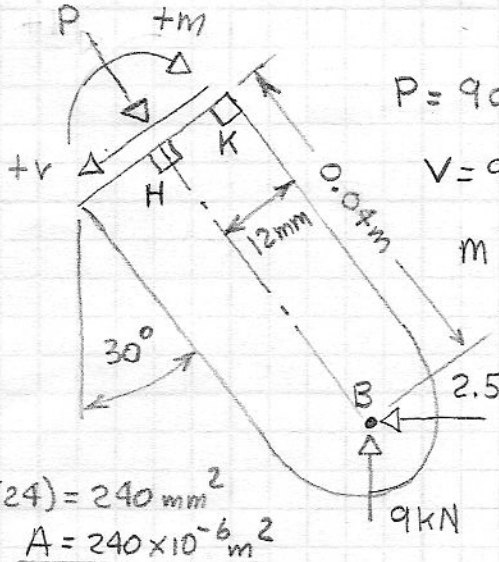
$\circlearrowleft + M_B = 0 = 120\cos 30^\circ R_A - 60\sin 30^\circ (9)$

$R_A = 2.598\ kN$

$\uparrow + \sum F_y = 0 = B_y - 9 \quad B_y = 9\ kN$

$\pm \rightarrow \sum F_x = 0 = 2.598 - B_x$

$B_x = 2.598\ kN$



$P = 9\cos 30^\circ + 2.598\sin 30^\circ \quad P = 9.093\ kN$

$V = 9\sin 30^\circ - 2.598\cos 30^\circ \quad V = 2.25\ kN$

$m = 9000(0.04\sin 30^\circ) - (2598)0.04\cos 30^\circ$

$m = 90\ N\cdot m$

$A = 10(24) = 240\ mm^2$

$A = 240\times10^{-6}\ m^2$

$I = \frac{10(24)^3}{12} = 11.52\times10^3\ mm^4$

$I = 11.52\times10^{-4}\ m^4$

a) Point H:

$\sigma_x = -\frac{P}{A} = -\frac{9.093\times10^3}{240\times10^{-6}}$

$\sigma_x = -37.9\ MPa$

$\tau_{xy} = \frac{3V}{2A} = \frac{3(2.25\times10^3)}{2(240\times10^{-6})}$

$\tau_{xy} = 14.06\ MPa$

b) Point K:

$\sigma_x = -\frac{P}{A} - \frac{Mc}{I} = -\frac{9.093\times10^3}{240\times10^{-6}} - \frac{90(0.012)}{11.52\times10^{-9}}$

$\sigma_x = -131.6\ MPa$