Machine Dynamics – Assignment 3

A crank-slider mechanism is shown in Figure 1. Perform kinetostatic analysis for the mechanism. The crank is running at 3600 rpm (constant speed) CCW. The stroke is 76 mm. L/R = 3.5 (L: length of the coupler, R: length of the crank), $m_2 = 5$ kg, $m_3 = 0.5$ kg, $m_4 = 0.3$ kg, $r_{G2} = 0.3R$, $r_{G3} = 0.36L$, $I_{G2} = 0.05$ kg m2, $I_{G3} = 0.002$ kg m2. Ignore friction. The gas force is shown as the black curve in Figure 2.

1) Determine L and R according to the required stroke.

2) Consider the gas force only, determine the corresponding shaking force, the shaking moment based on the point O, and the output torque T_2.

3) Consider the inertial force only, determine the corresponding shaking force, the shaking moment based on the point O, and the output torque T_2.
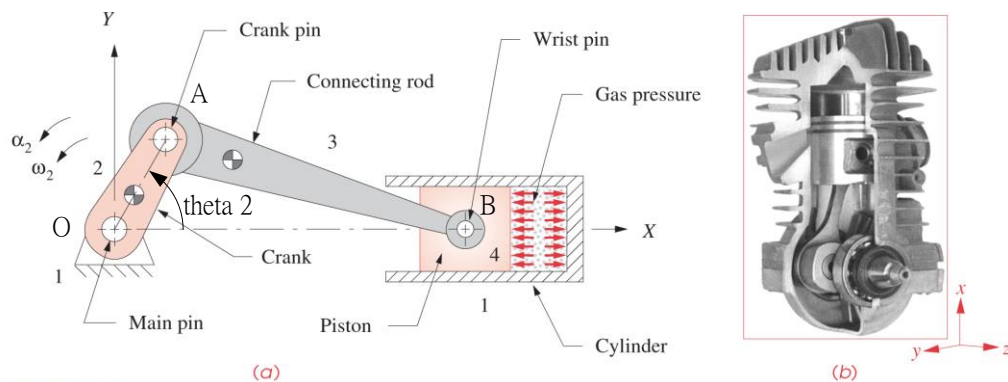

FIGURE 13-3

Fourbar slider-crank mechanism (a) for single-cylinder internal combustion engine (b) Mahle Inc., Morristown, NJ
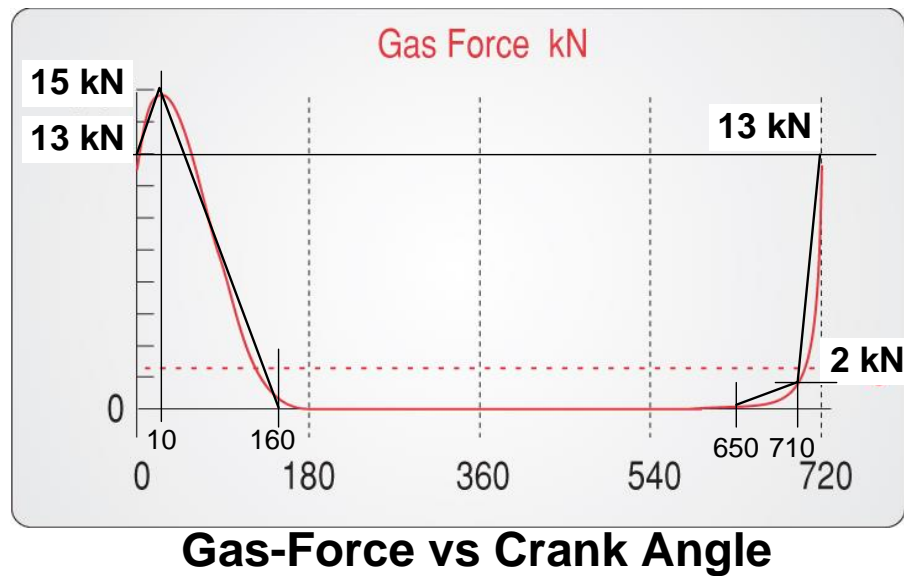
Figure 1. Engine

Figure 2. Gas Force