1) Modify your Working Model (WM) slider crank simulation as detailed below and on the following page. Attach a screen shot of your WM mechanism. Be certain to shift the centroid for link 3.

a) Use a motor to drive the crank at constant 1000 rpm for R = 0.985 inch and L = 4.33 inch.

b) Use a statically balanced crank (G2 at A).

c) Modify your connecting rod and piston to use inertial data from H10.

0.462 lbm 1.043 inch 1.5 lbm.in2 0.781 lbm

m3 \_\_\_\_\_\_\_\_\_\_\_ BG3 \_\_\_\_\_\_\_\_\_\_\_ JG3 \_\_\_\_\_\_\_\_\_\_\_ m4 \_\_\_\_\_\_\_\_\_\_\_

2) Plot crank torque as a function of crank angle from your WM simulation and from the two-mass equivalent link approximation on the same MATLAB graph.

m3B \_\_\_\_\_\_\_\_\_\_\_ m3C \_\_\_\_\_\_\_\_\_\_\_

3) Plot shaking force with F21X on the x axis and (F21Y + F41Y) on the y axis from your WM simulation and the two-mass equivalent link approximation on the same MATLAB graph.

4) Add a counter balance mass at radius R to the crank equal to m3B and repeat part 3) above. Use the same scale as part 3).

5) Adjust your counter balance mass to minimize the maximum shaking force and repeat part 3) above. Use the same scale as part 3).

mBAL \_\_\_\_\_\_\_\_\_\_\_ FS\_MAX \_\_\_\_\_\_\_\_\_\_\_

**EXTRA CREDIT**

Add a second piston and connecting rod to model the two cylinder in-line air compressor demonstrated in class. Plot shaking force from your WM simulation and the two-mass equivalent link approximation on the same MATLAB graph. Use the same scale as part 3). Attach a screenshot of your mechanism.

**WM dynamic analysis for slider crank**

1) World Gravity - none

2) Select the Motor and then the Split button

3) Select the link that you used for your crank

a) Change the link length to 1.97 inches

b) Move point A to the center so that AB = R = 0.985

c) Select the Join button

d) Add a square point to the left end of the Crank

4) Select the Con Rod

a) Window Properties - change mass and mass moment

b) Window Appearance – show COM

c) Window Geometry – change COM x-offset

5) Select the Piston - Window Properties - change mass

6) Select the Crank – Measure Position Rotation Graph

7) Select the Piston – Measure Acceleration X Graph

8) Select the Motor

a) Measure Torque Transmitted

b) Measure Force

9) Select the square point for piston slider constraint – CANNOT measure force

10) Select wrist pin between Con Rod and Piston – Measure Force

11) Run and then Export

12) Create a small circular object for counter balance mass

a) Place a square point at its center

b) Window Properties - change mass

c) Select the square point on the over-balance mass

d) Hold down the Shift Key and also select the square point on the left end of the Crank

e) Select the Join button