ME 2201 **Name of Student**_____

Jul – Nov 2022

Project due on 11th November by 5 PM. Please submit a report no more than 4 pages. A physical model can be submitted in person or a video of the model can be submitted at the link on Google Classroom.

A proposed design for a new flat-bed truck is being considered as shown in Figure 1. Your task is to design the most suitable mechanism that will lift a rectangular container (width AB = 0.91 m, height AC = 1.12 m, and depth into the paper AE = 1.37 m) from the ground and store it in the back of the truck as shown in Figure 1. The initial iteration of the mechanism design should be a planar linkage with a mobility M = 1.

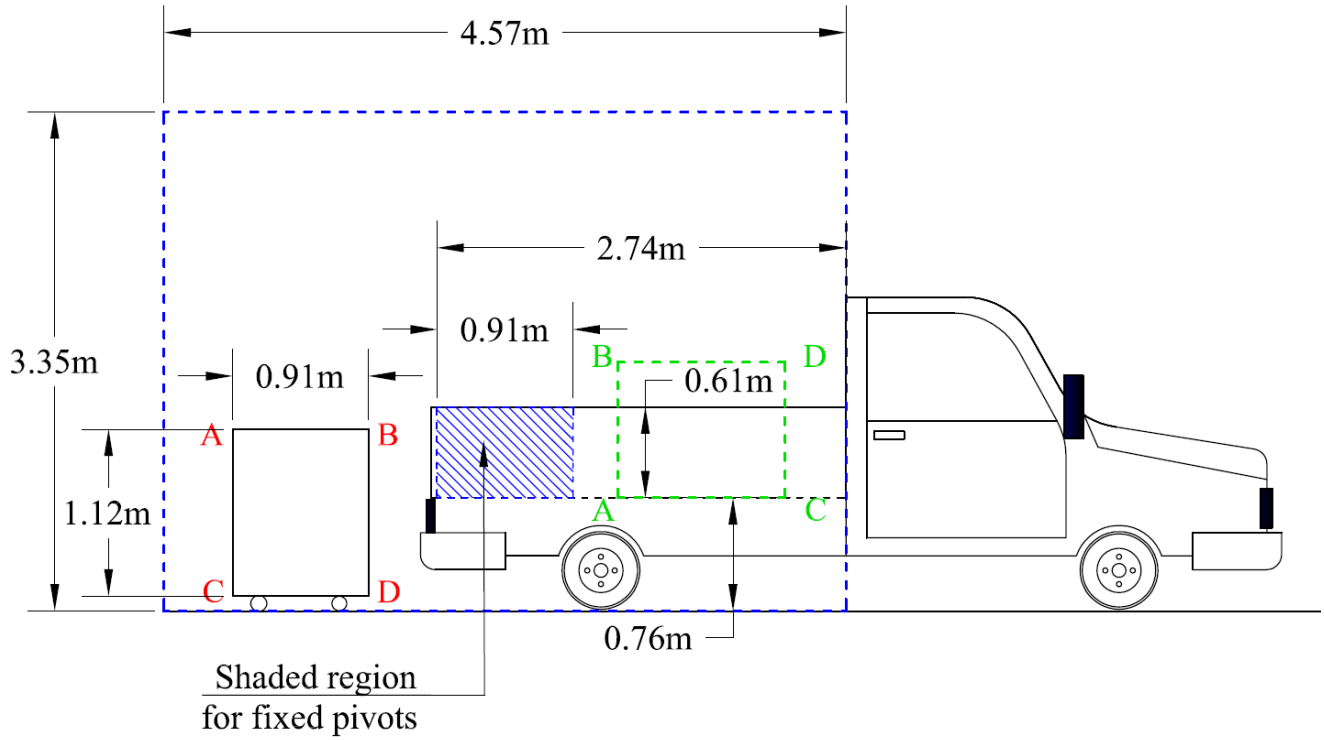
Use graphical kinematic synthesis to design the mechanism, or mechanisms, that will satisfy the following constraints. You need not restrict the design to a 4 bar.
(i) Ground pivots must be mounted on the shaded portion of the truck (see Figure 1). The moving pivots must be mounted on the container but should not extend beyond its boundaries.
(ii) The motion of the container is constrained to lie within the allowable workspace (indicated by the dashed lines in Figure 1).
(iii) The links of the mechanism must not travel outside the allowable workspace.
(iv) The container must be placed in the open back area of the truck (indicated by the dashed lines in Figure 1). The orientation of the container in the truck is important and must be satisfied. The lid of the container is **denoted by the rectangle ABEF and the hinge of the lid is denoted by the line AE**.

You will need to check at least one intermediate position of the mechanism to ensure that the container will not touch, or interfere with, the body of the truck. Include your sketches of initial designs and a write up of your design process including at least two of your trial mechanisms. Describe the procedure that must be followed in order to move your mechanism and the container. Also address the following questions and concerns:

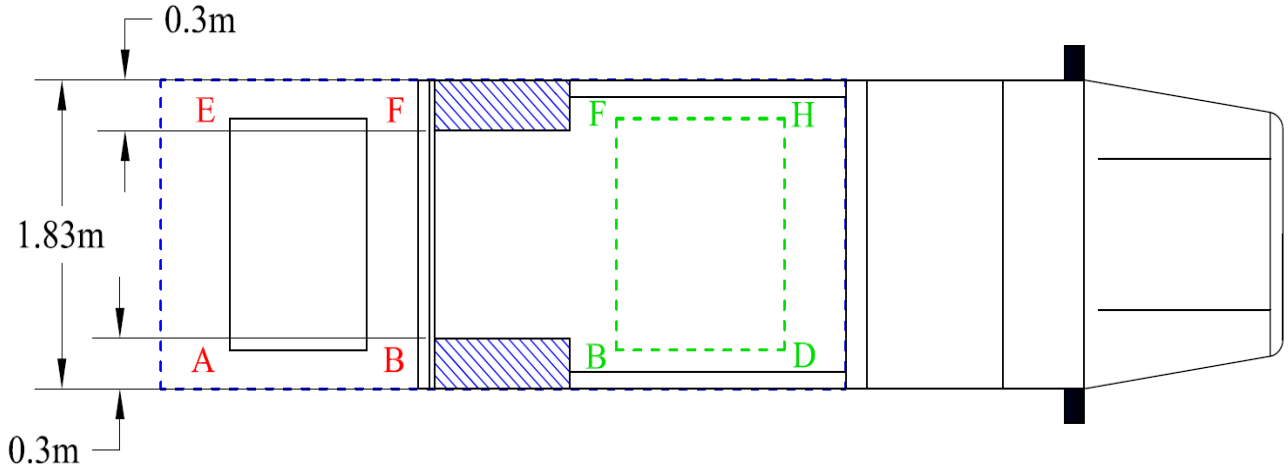
1) Does the motion of the links interfere with the smooth operation of the truck? Is the motion of the container smooth while your mechanism is in operation?
2) What are the extreme values of the transmission angle of your mechanism?
3) If it's a 4 bar, does your mechanism meet Grashof's criteria? Explain why or why not.
4) What recommendations (or changes) would you suggest with your design before you decide to go into production on a large scale?

Build a scaled planar model of your mechanism using any materials available to you contingent to the final links being rigid. Figure 2 is a worksheet of the flat bed truck that may be helpful in the design of the mechanism. **The scale that is used for Figure 2 is 10 mm = 333 mm.**
Note that care must be devoted to the joints connecting the rigid links of the mechanism to ensure that the desired motion is possible.

The model must work correctly and must not come apart when guided through the operating range of motion. Verify with your model that the container can be lifted correctly, and in a smooth manner, without exceeding the allowable workspace. The allowable workspace for the mechanism and the container is 3.35 m above the ground and 4.57 m behind the cab of the truck, see Figure 1.



(a) Side view of the flat-bed truck.



(b) Top view of the flat-bed truck.

Figure 1. The workspace for the flat-bed truck.

Figure 2. A worksheet to assist with the mechanism design. **Scale: 10 mm = 333 mm.**