جامعة القاهرة

Faculty of Engineering
Cairo University

MDPN251 – Kinematics of Machine Components

Project

“Top Hung Window Hinge”

Prepared for

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Section I

Introduction:

A window hinge mechanism is a device that allows a window to swing open or closed. It consists of two main components: the hinge and the pivot point. The hinge is a metal strip with a series of interconnected, rotating disks or barrels that allow the window to move. The pivot point is a fixed point on the frame of the window around which the window rotates.

There are several types of window hinge mechanisms, including butt hinges, pivot hinges, and friction hinges. Butt hinges are the most common type of hinge and are typically used on traditional, double-hung windows. Pivot hinges are often used on large windows or doors and allow the window to rotate around a vertical axis. Friction hinges are used on casement windows and rely on friction to keep the window in place when it is open.

The proper functioning of a window hinge mechanism is essential for the smooth operation of a window. If the mechanism is not properly maintained, it can become stuck or difficult to open and close. Proper maintenance of a window hinge mechanism includes regularly lubricating the hinge and ensuring that it is properly aligned with the pivot point.

Section II

Mechanism Parts and Dimensions

A top hung window hinge mechanism consists of several parts that allow the window to open and close smoothly. The main parts include the hinges, which are attached to the window frame and the window sash, and the pivot points, which allow the window to pivot when it is opened and closed. The dimensions of these parts can vary depending on the size and weight of the window, but typically the hinges are about 3 to 4 inches long and the pivot points are located at the top and bottom of the window. Other parts of the top hung window hinge mechanism may include springs or other tension devices to help hold the window in place, as well as handles or levers to assist with opening and closing the window.

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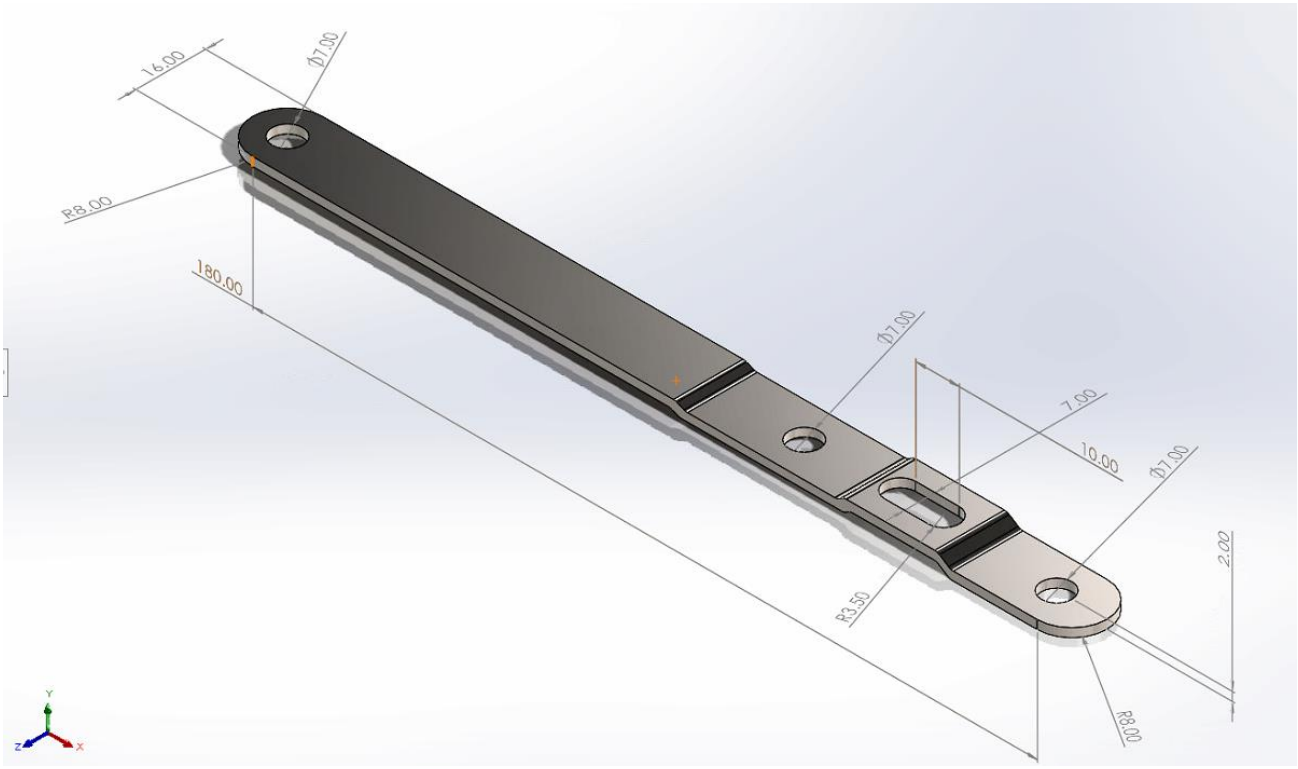

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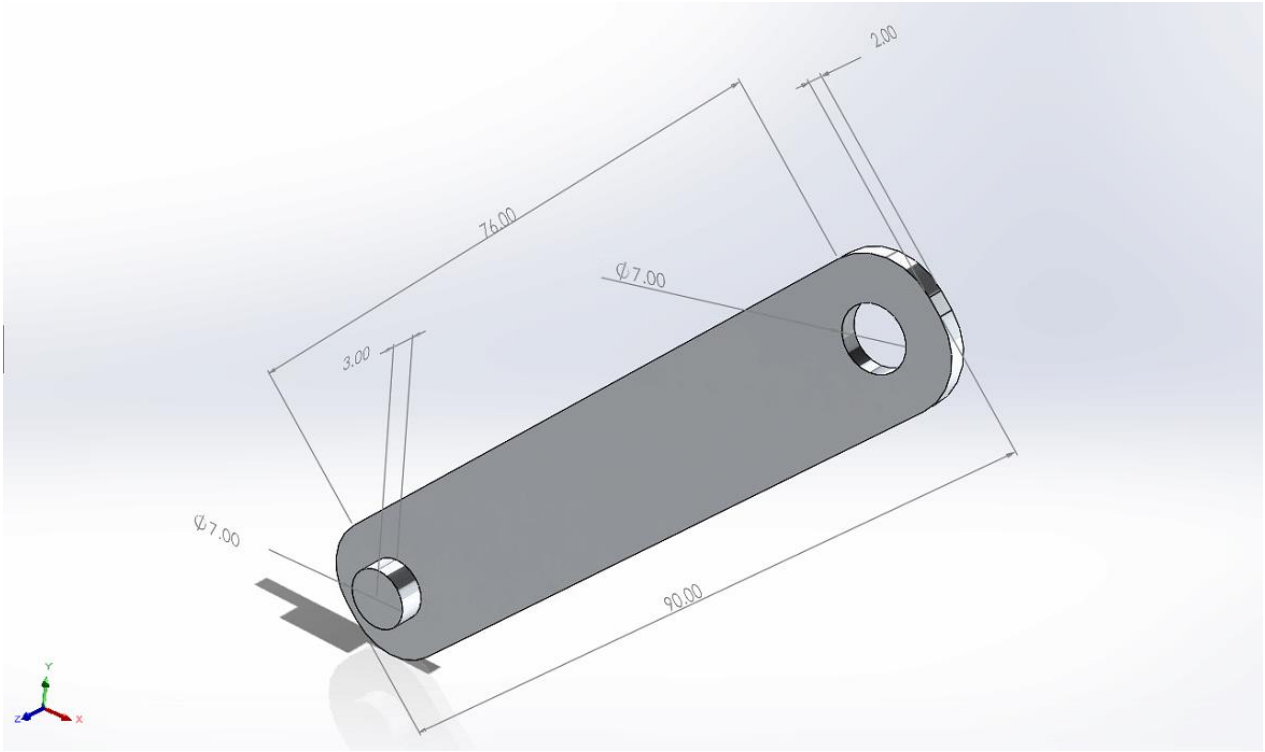

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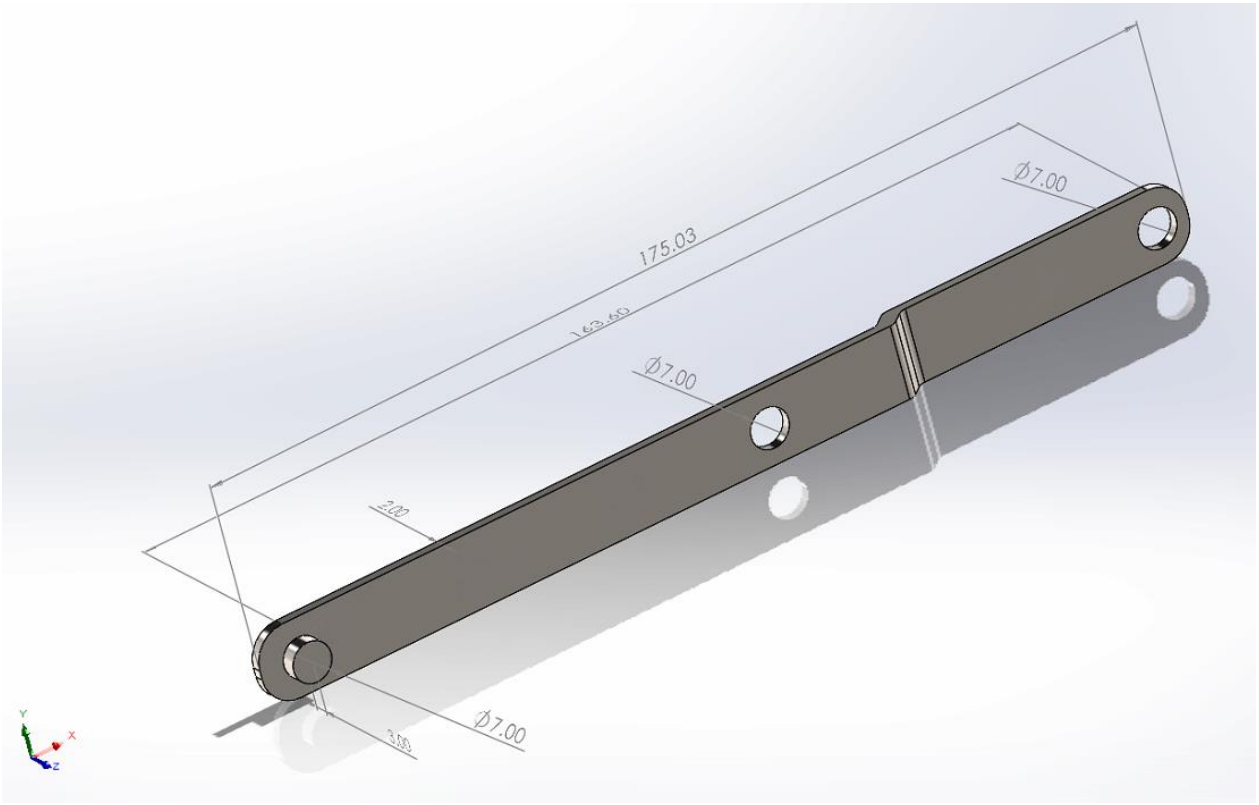

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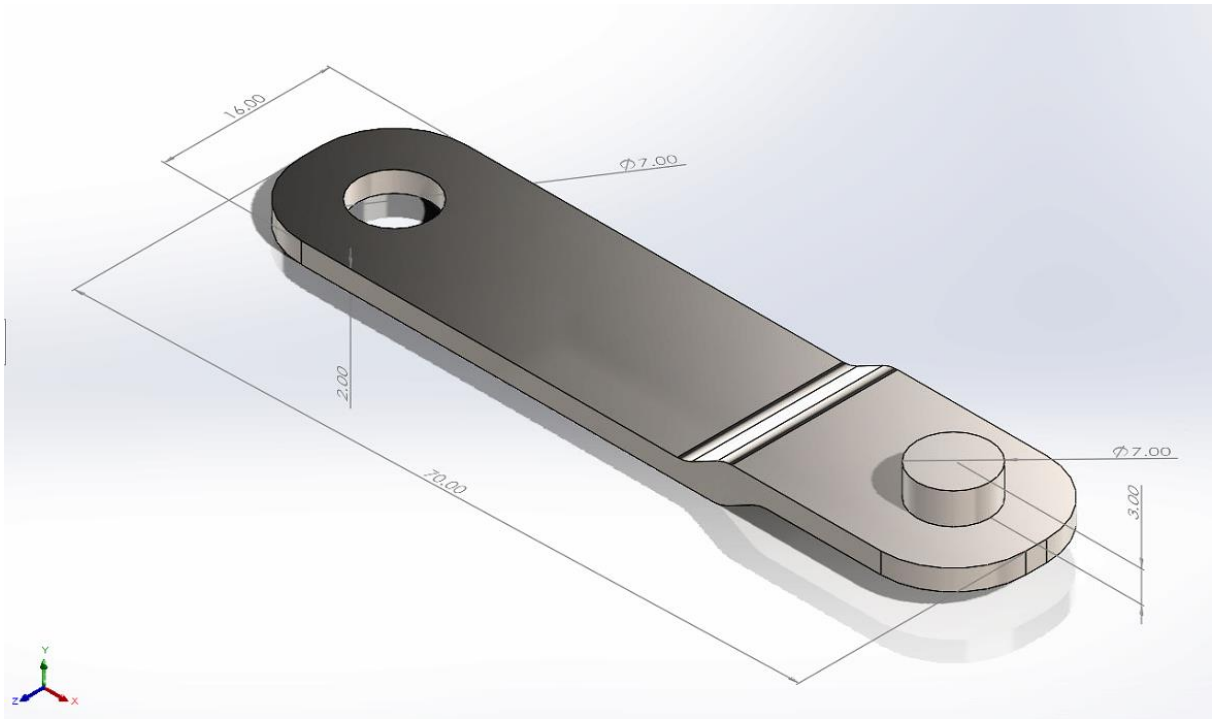

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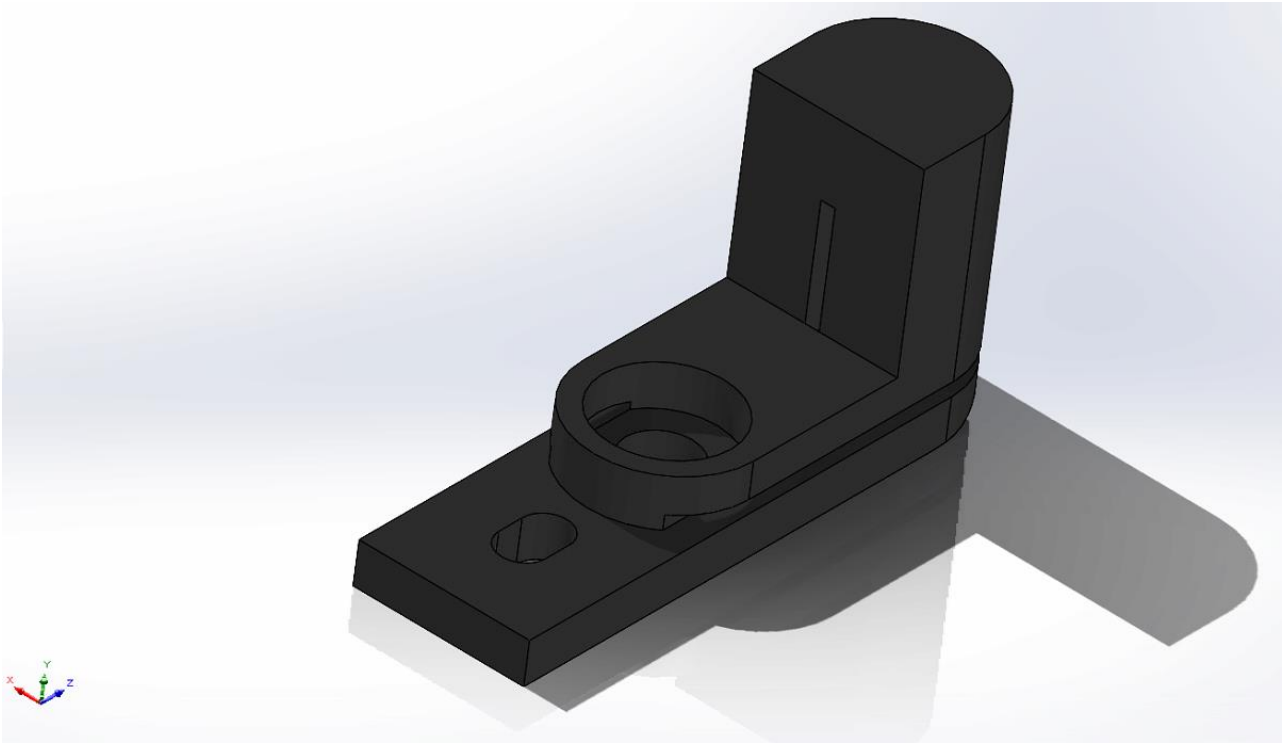

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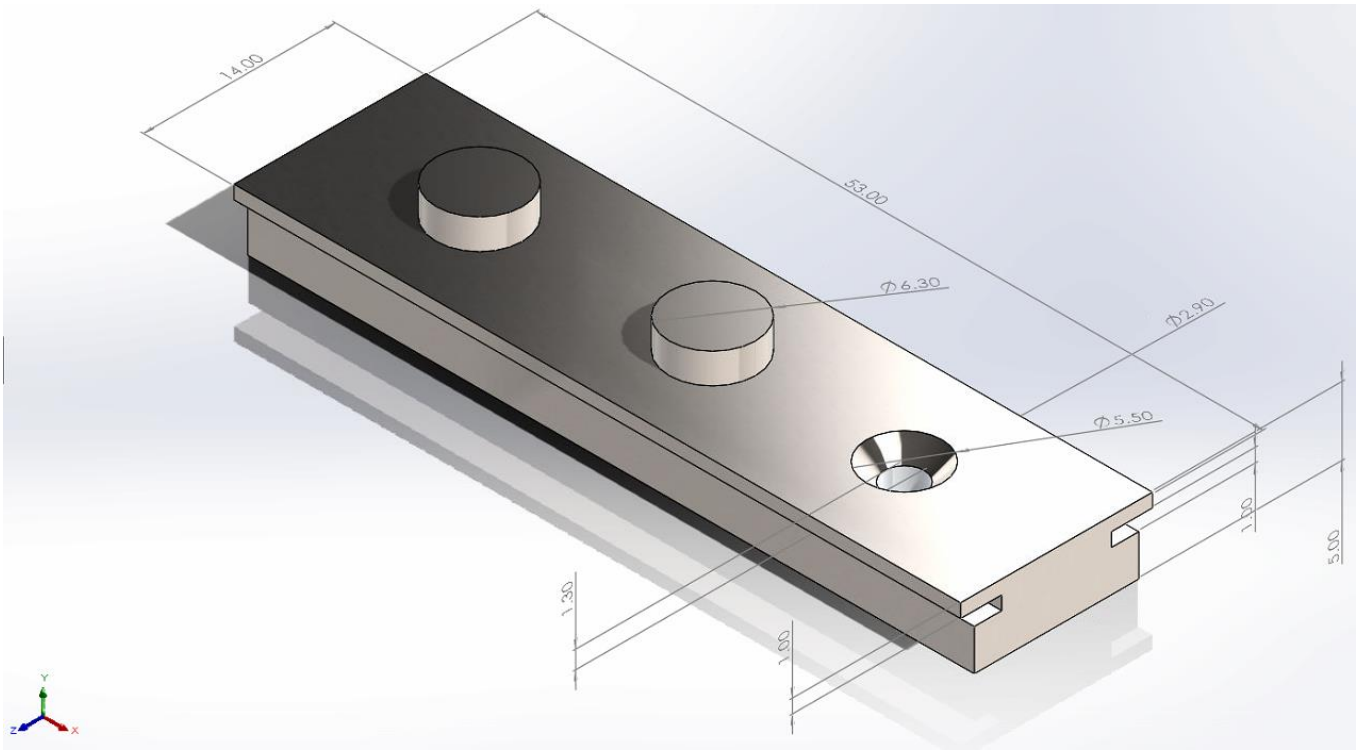

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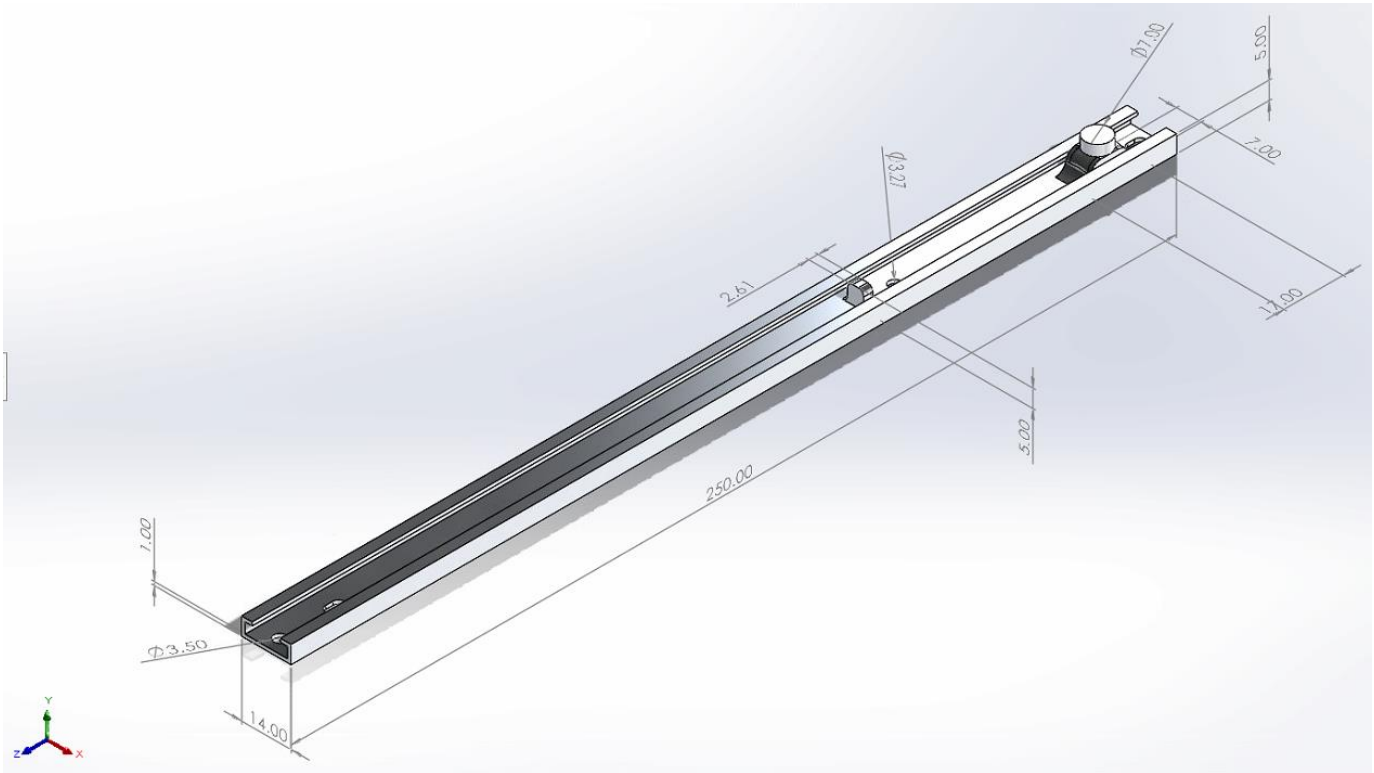
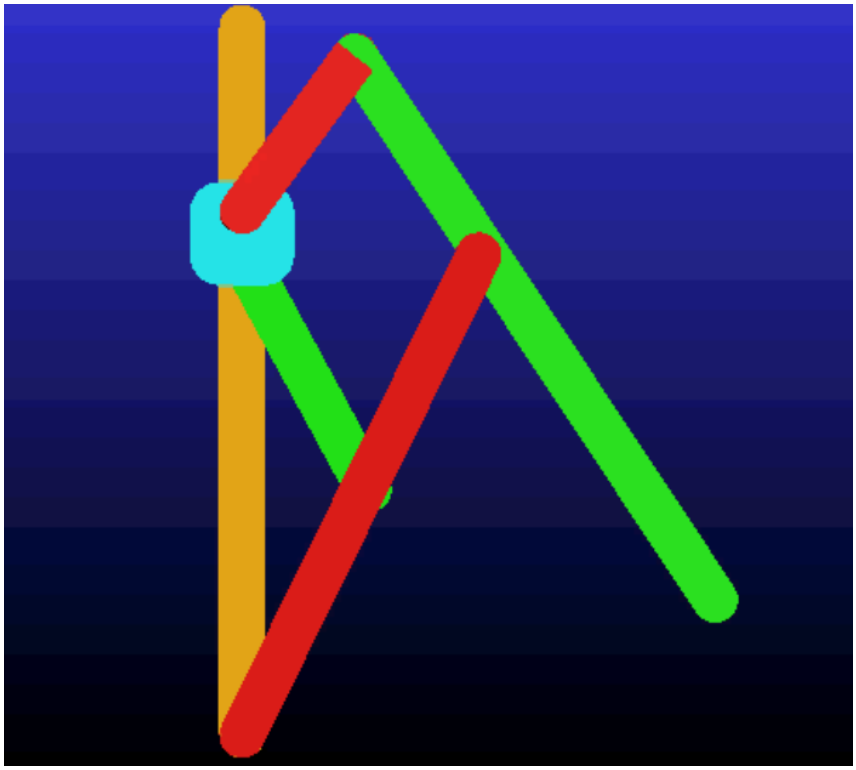


Section III

Kinematics Analysis (Using Adams):

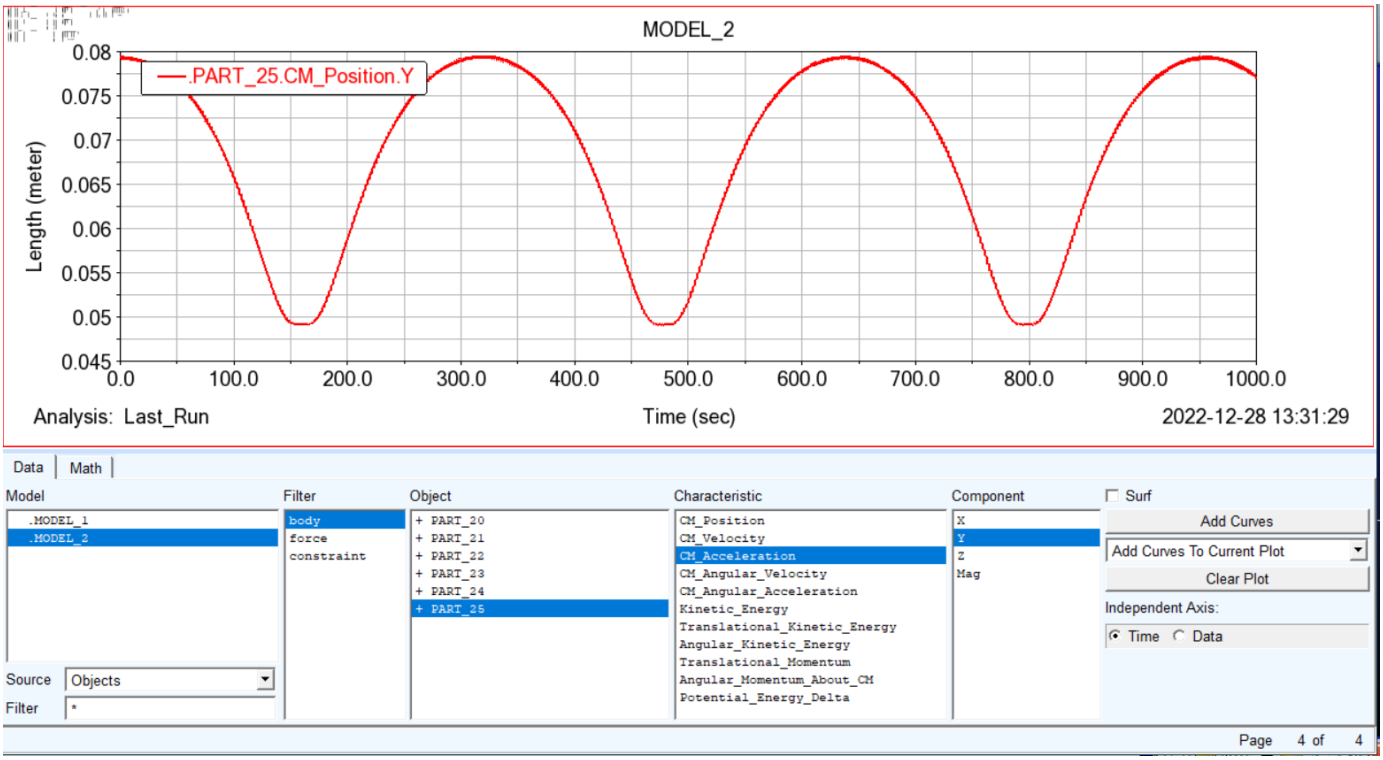
Kinematics analysis using Adams is a computer-aided engineering (CAE) technique that allows engineers to simulate the motion of mechanical systems and predict their behavior under various operating conditions. With Adams, engineers can analyze the kinematics of complex mechanisms, such as robots, vehicles, and machinery, and optimize their design for performance and reliability. The software uses a system of equations to describe the motion of the system, including its positions, velocities, and accelerations and solves these equations using advanced numerical methods. This allows engineers to study the motion of the system in detail, including its response to external loads and forces, and identify any potential problems or areas for improvement. Overall, kinematics analysis using Adams is an essential tool for designing and analyzing a wide range of mechanical systems and helps ensure that they will perform as intended in the real world.



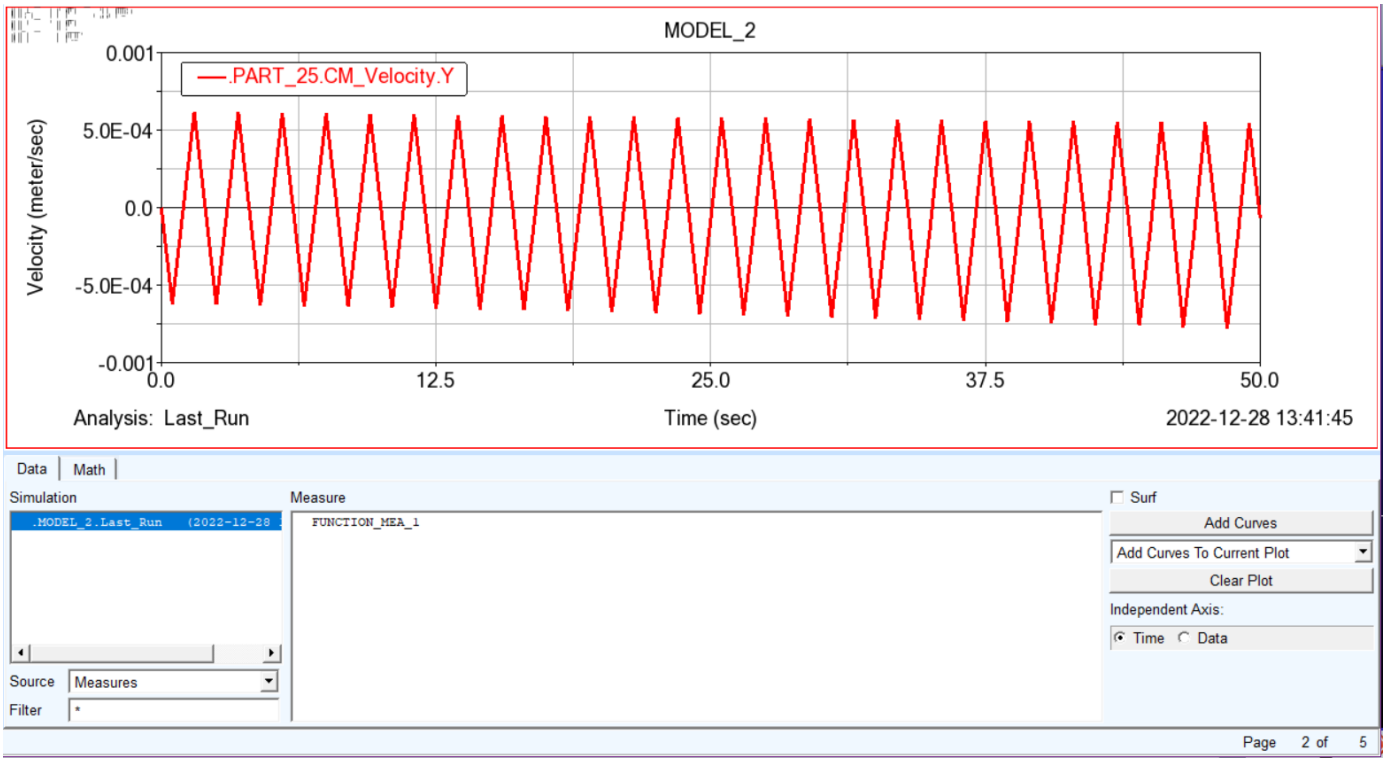
Position Analysis:

Lower link limiting position:49.2mm

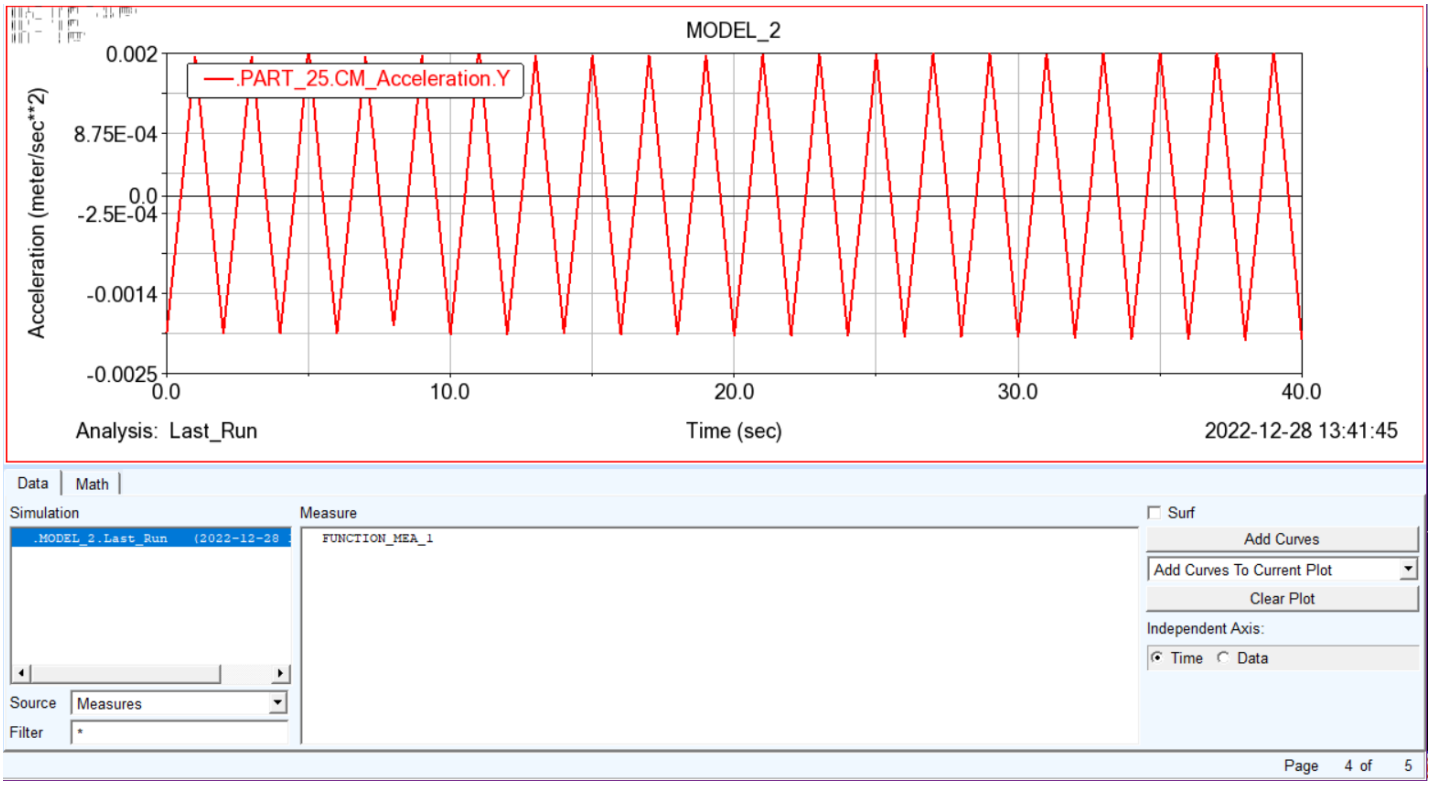
Upper link limiting position:79.5mm



Velocity Analysis:



Acceleration Analysis:



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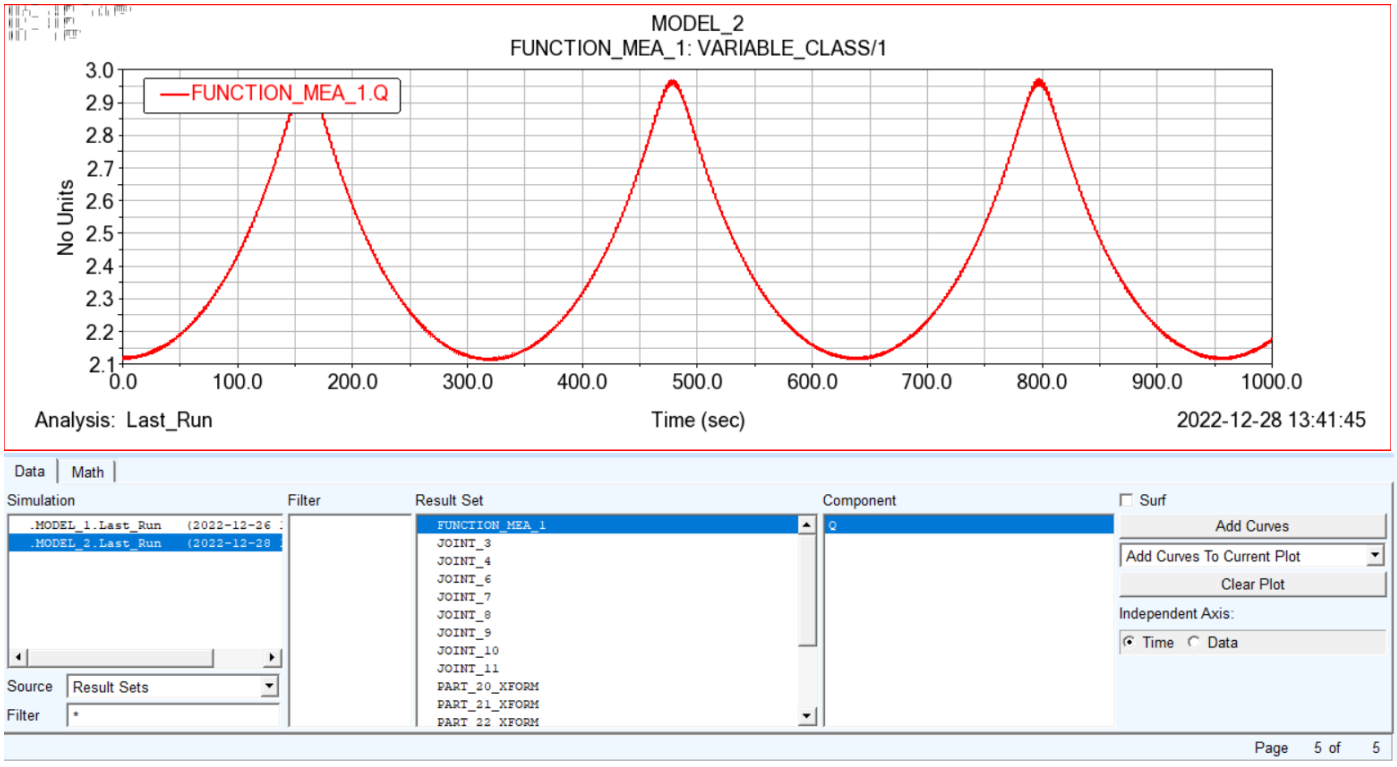

Section IV

Conclusion:

In conclusion, the top-hung window hinge mechanism is a vital component of any window system, as it allows the window to open and close smoothly while also providing support and stability. The kinematics of this mechanism are complex and involve the movement of several parts, including the hinges and pivot points, as well as any tension devices or handles that may be present. By analyzing the dimensions and movements of these parts, we were able to understand how the top-hung window hinge mechanism works and identify any potential areas for improvement. Overall, this project has provided valuable insight into the mechanics of top-hung window hinges and will be useful for improving the design and performance of future window systems.

Section V

References:

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- https://3h-hardware.en.made-in-china.com/product/wdXmSRIKkYVc/China-UPVC-Awning-and-Top-Hung-Window-304ss-Friction-Stay-Hinge-Arm.html
- Dr. Bassam's Adams tutorials