MCT 331 MIDTERM SUBMISSION

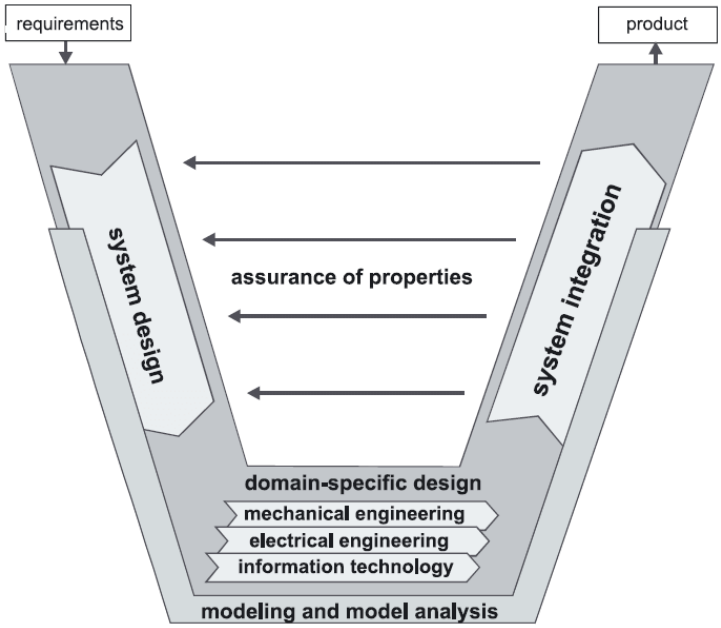
Assembly Module

Mohamed Ahmed Abdelmotaleb Shoaib 18P6395
18p6395@eng.asu.edu.eg

Contents

Abstract:

By talking about complex systems, systems engineering is always named as the only way out for the enhancement of system understanding and the reduction of system complexity in the design process. After an identification of the essential aspects and concepts for pursuing systems engineering. A standardization for the development process of the mechatronics system is VDI 2206.

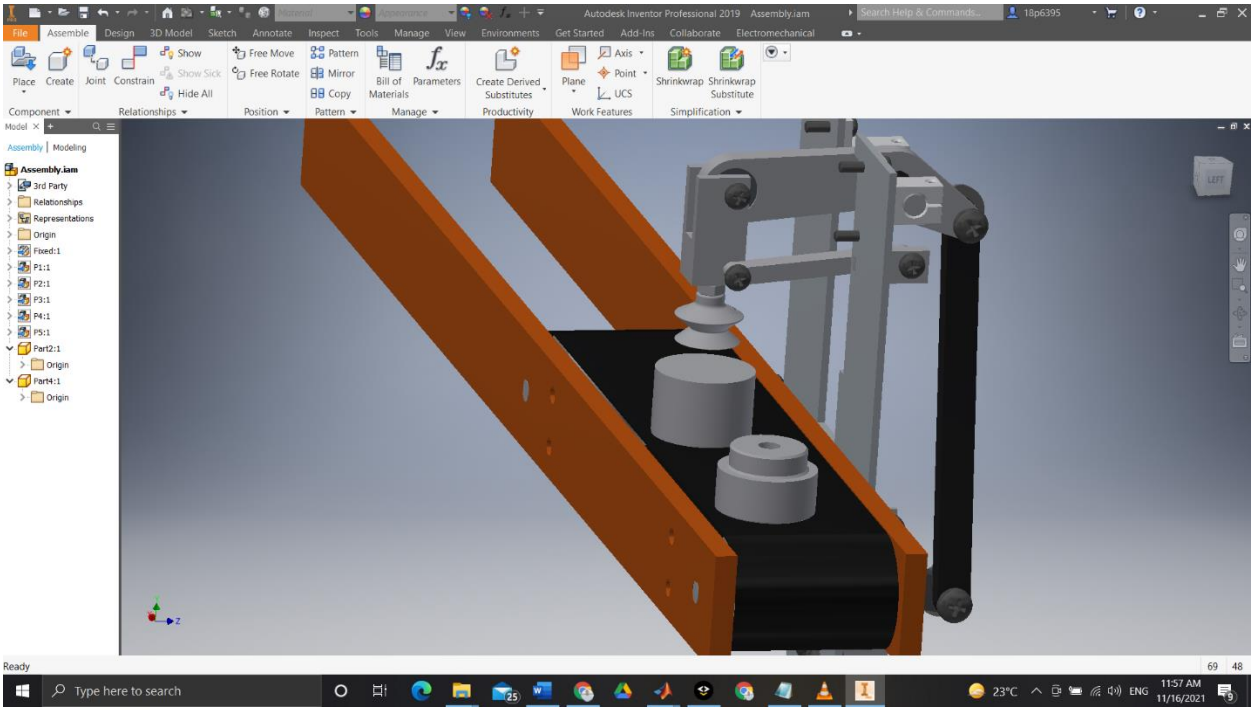


The main purpose of matlab simulation to try to make the system working and reliable without making a prototype of the project and cost money in real big project. The matlab helped us to see each module working.

Introduction:

The assembly module is responsible to put the 2 parts on each other. I used 2 four mechanism, the first one is moving the suction cup up and down, the second one is to fix the suction cup holder in its position so we can press the suction cup.

1. The Cad: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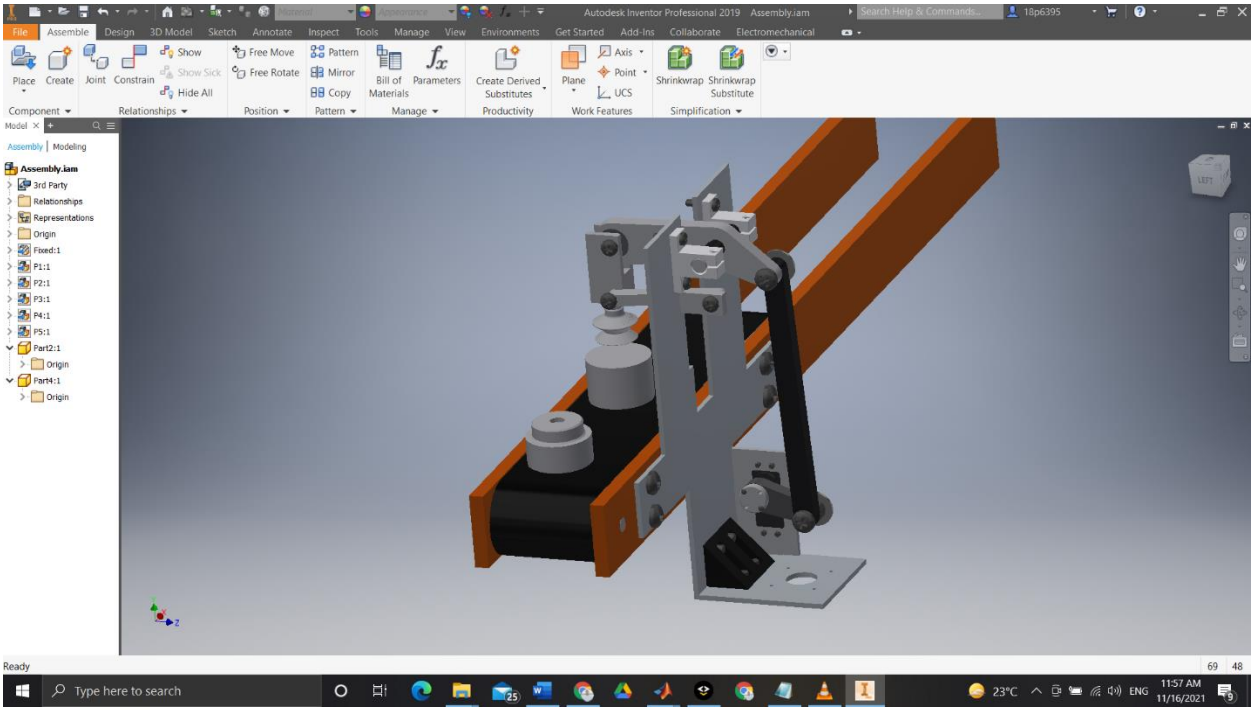
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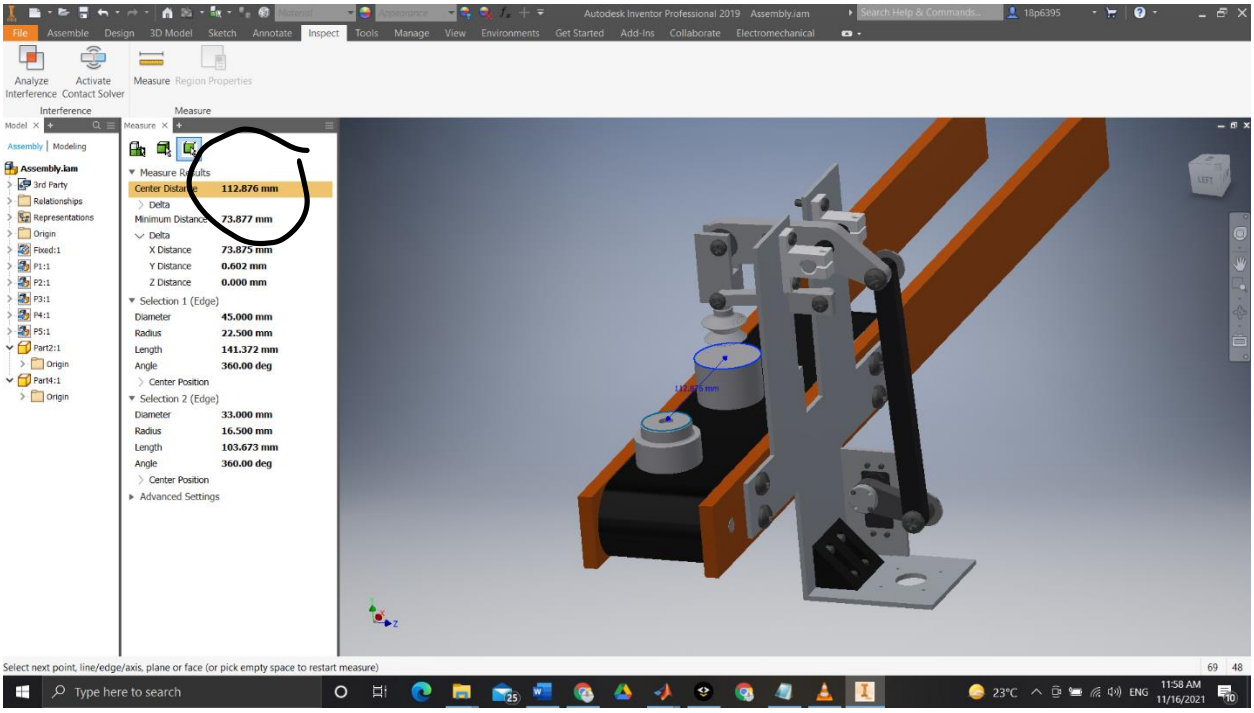
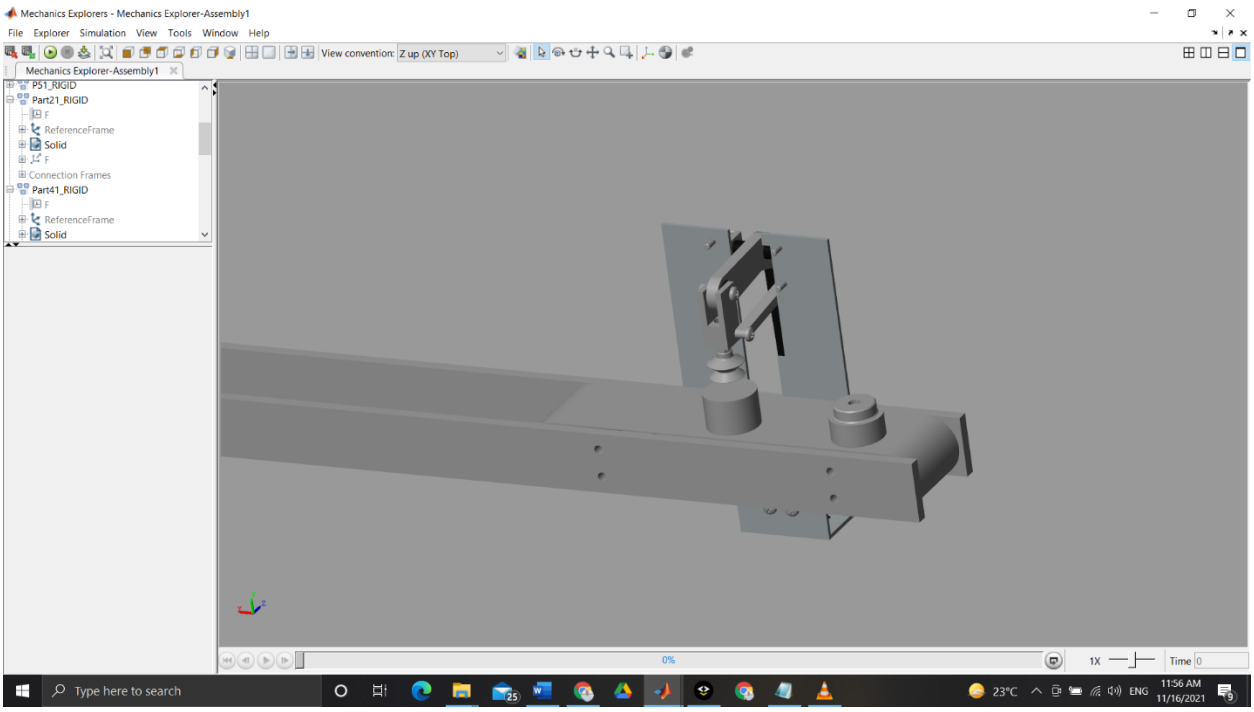


The distance between the 2 parts is about 113 mm will be used in the matlab, and the are concentric with the suction cup.

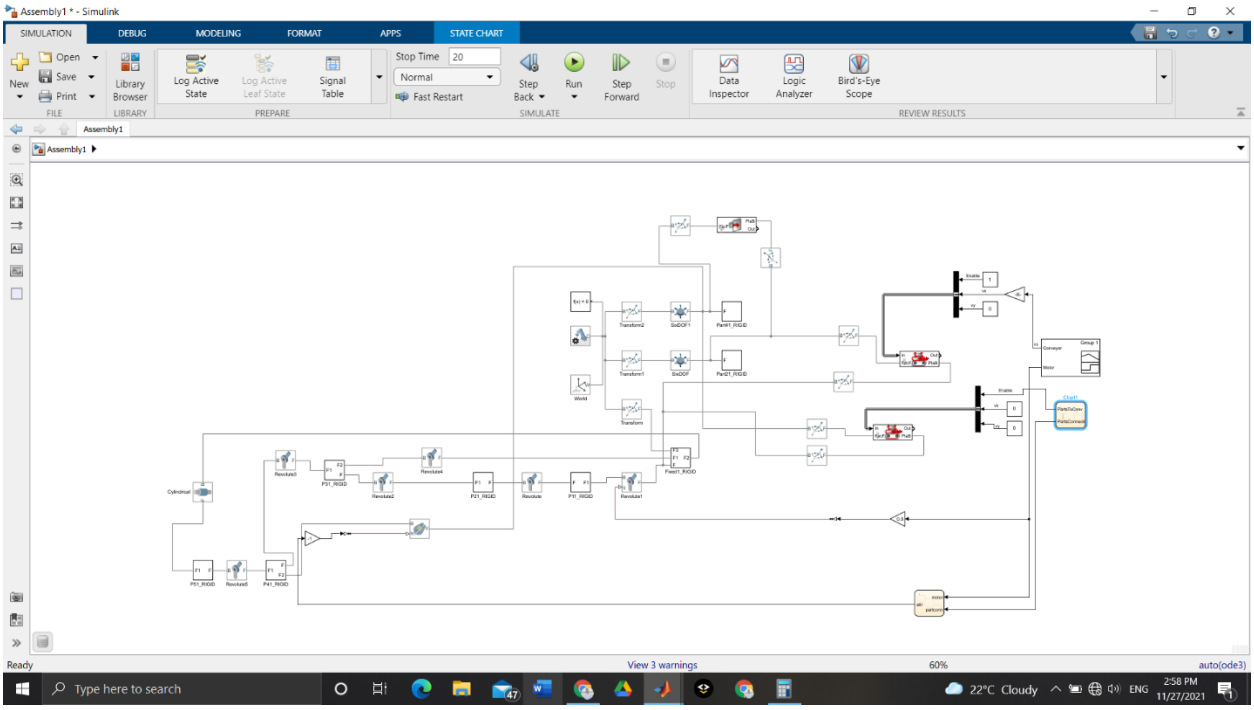
2. The Matlab:



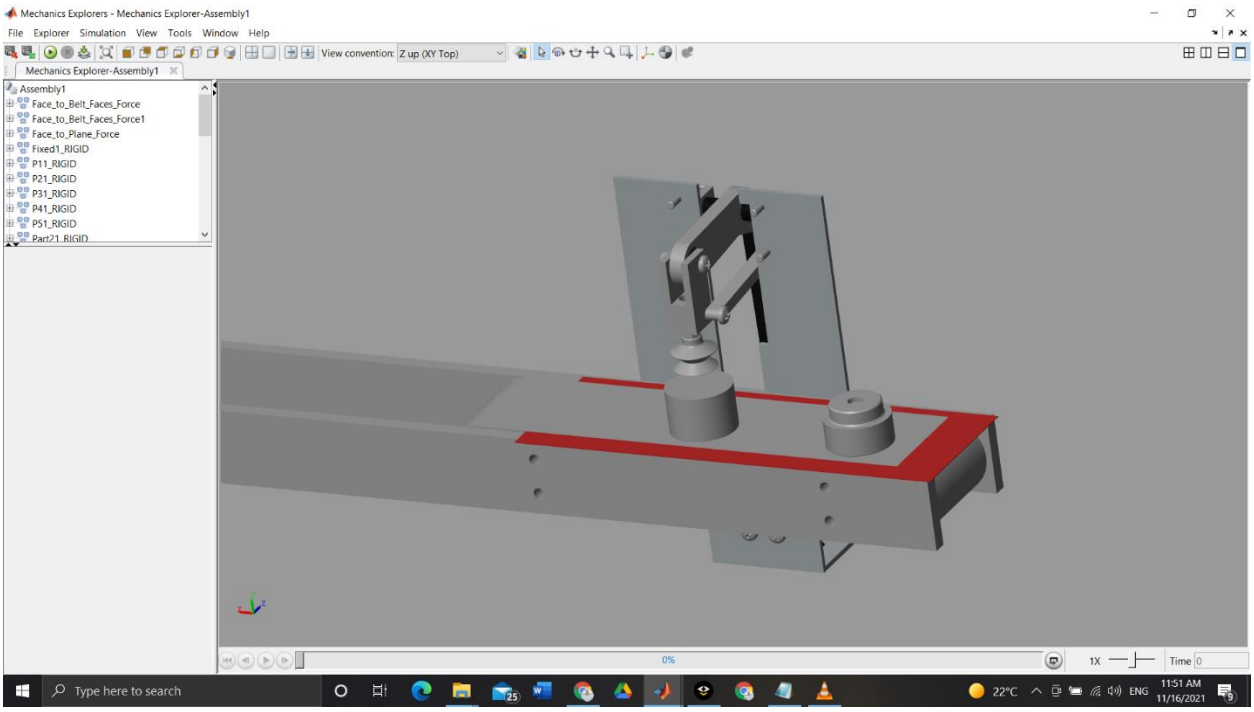
Video for the whole module working:

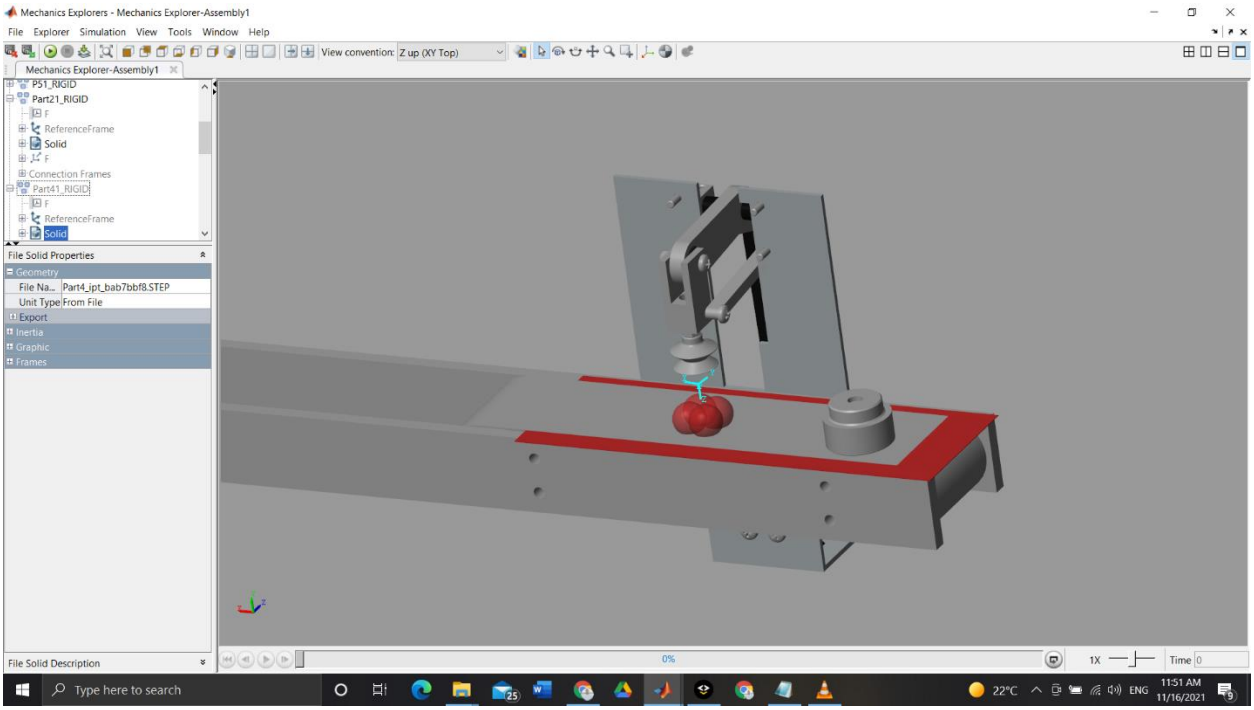
https://drive.google.com/file/d/1HVslpROE1Dep3GdlN3tZtgvX7XqWqQHC/view?usp=sharing

3. The Simulink Circuit:

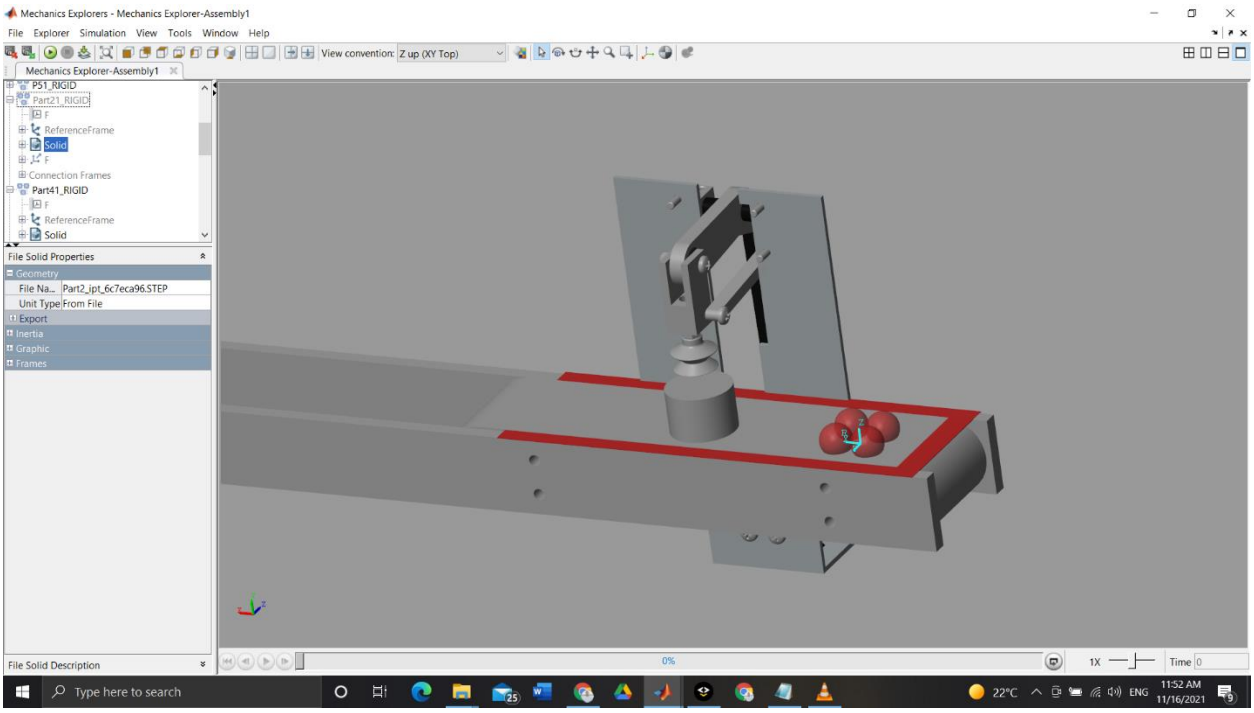


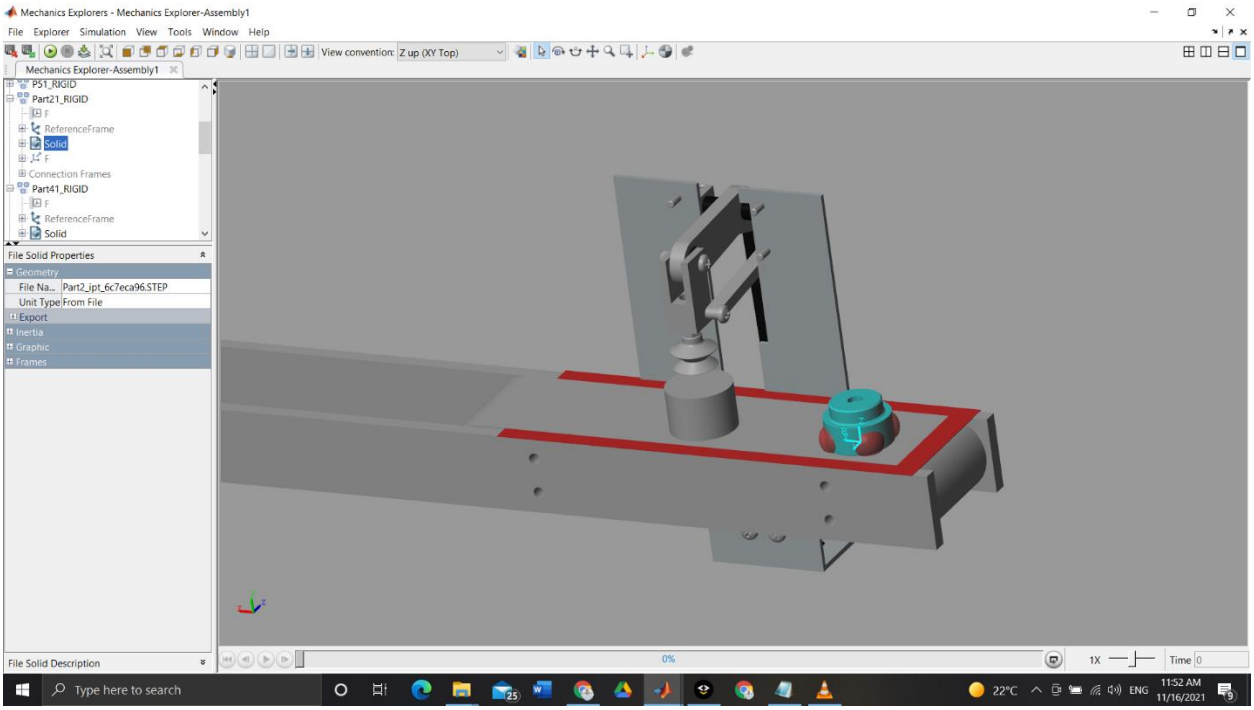
4. The Contacts:



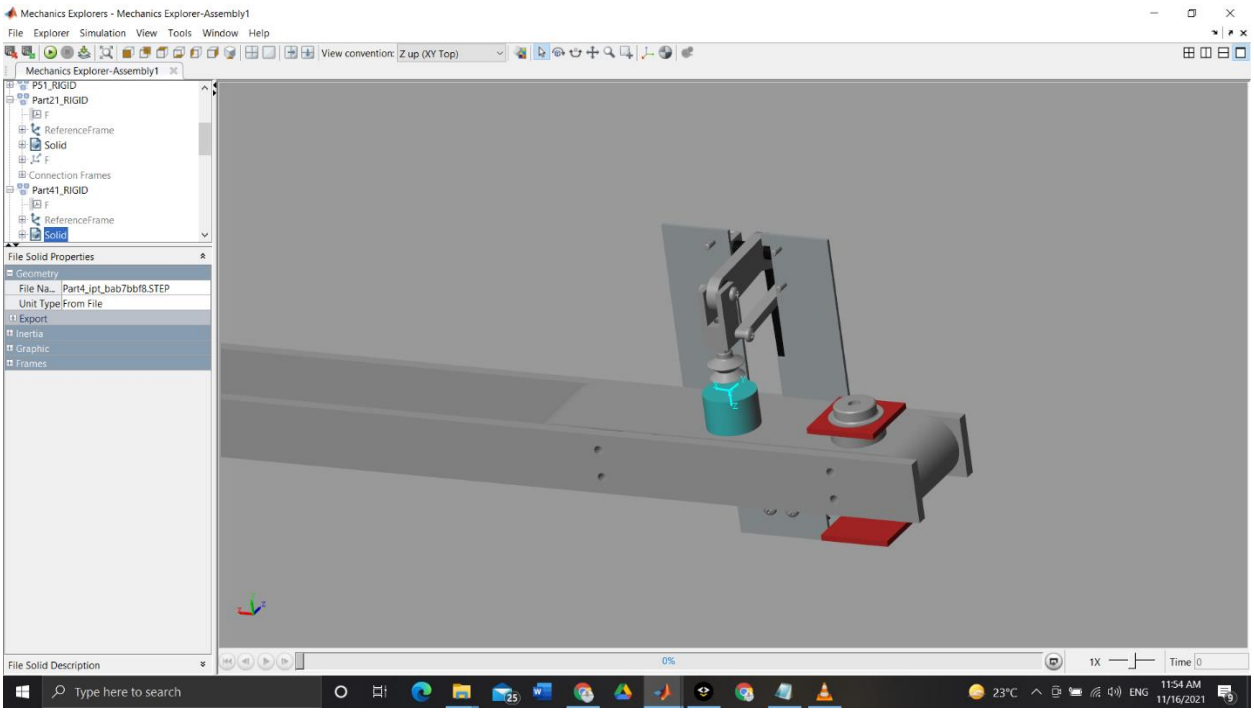


First part with the conveyer

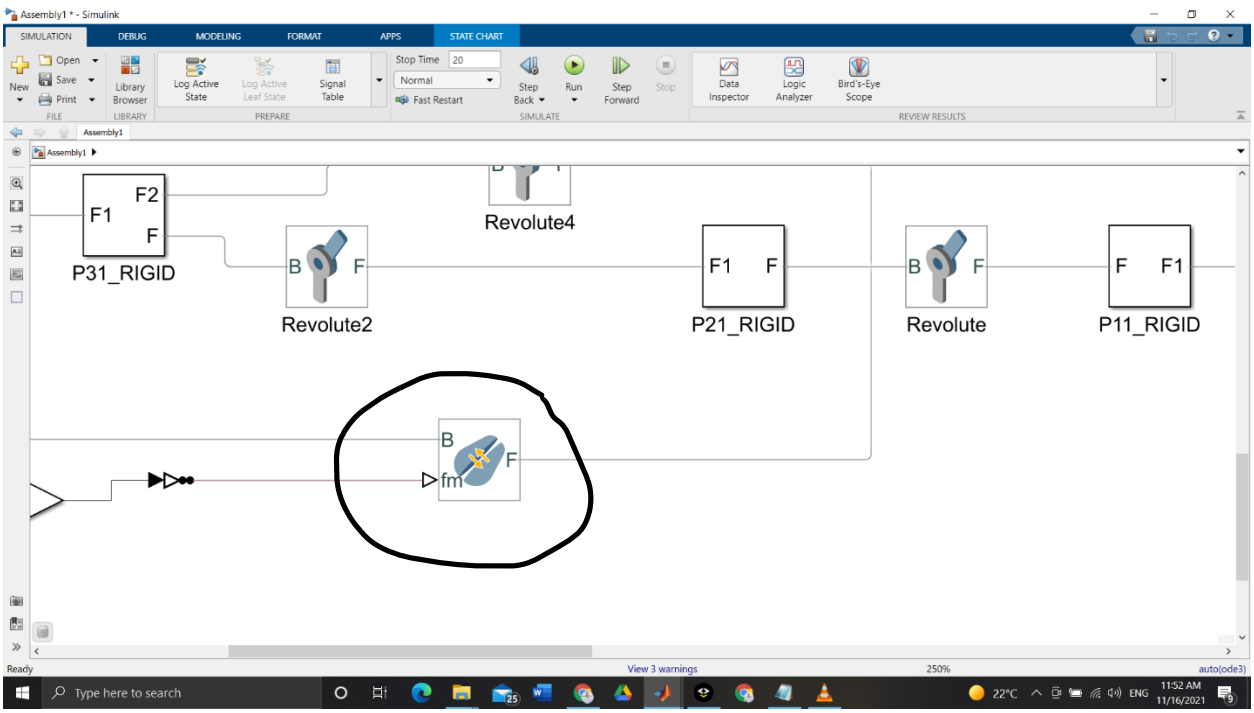




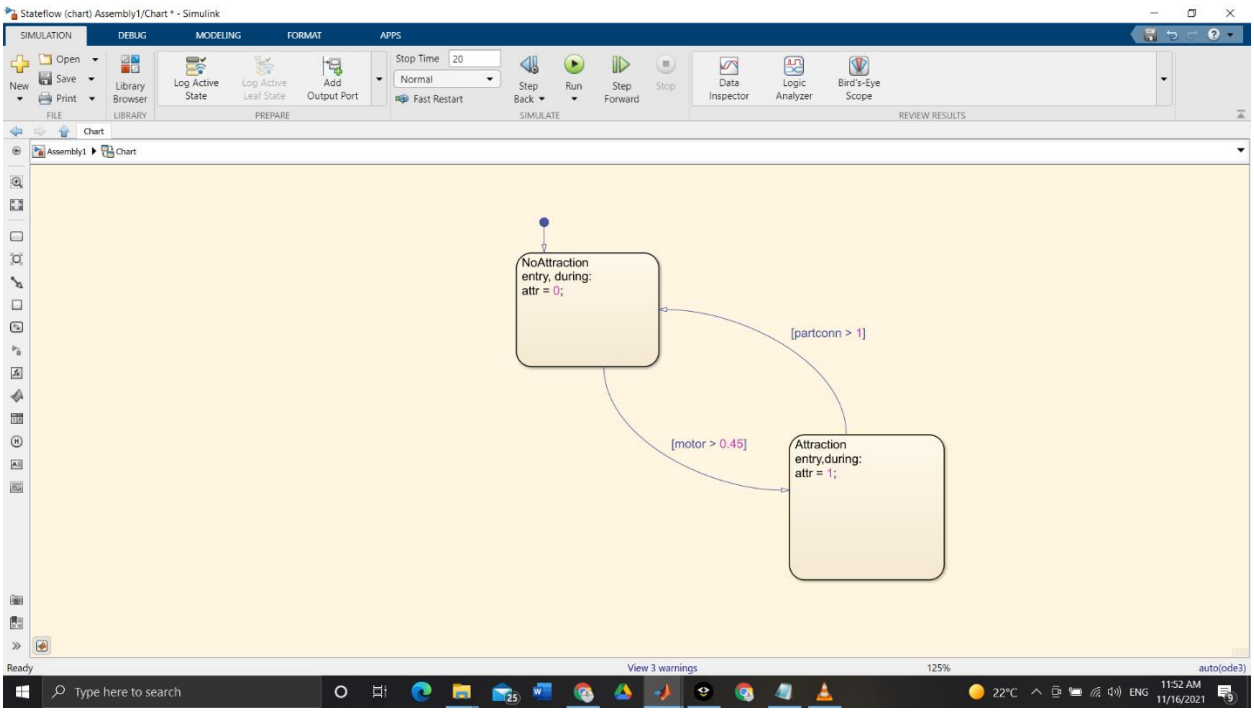
Second part with the conveyer



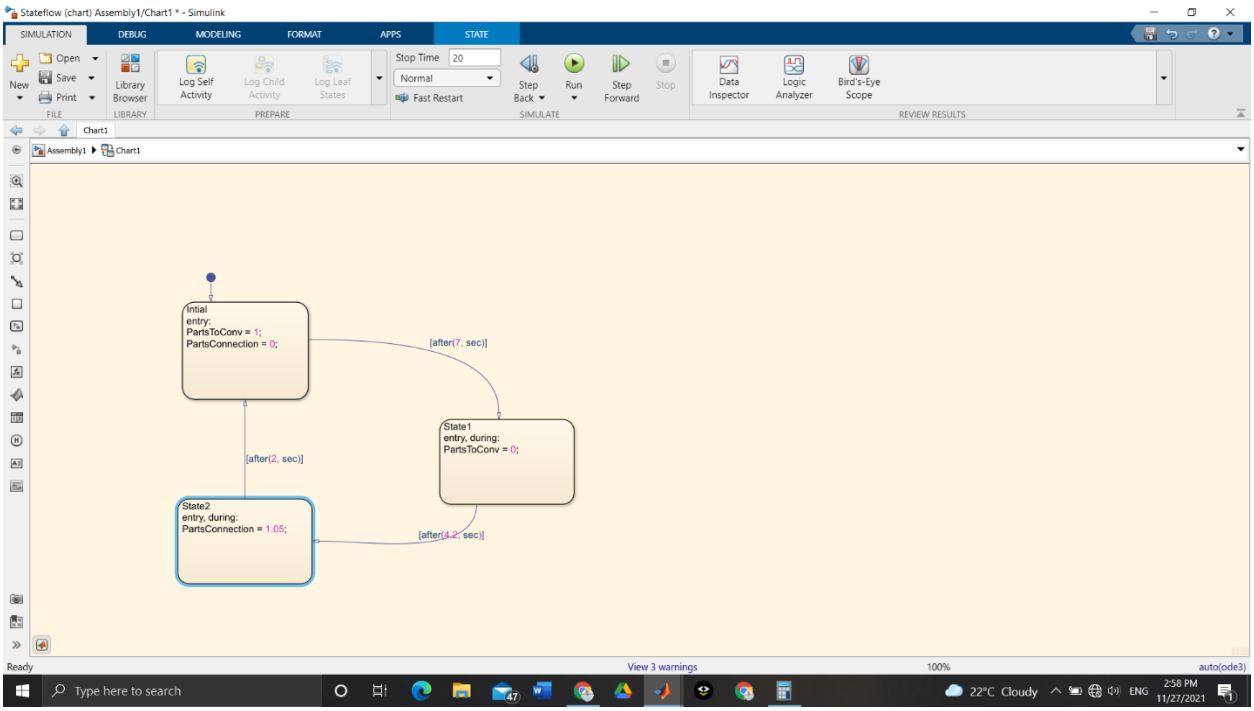
The 2 parts together with face to plane.



The suction cup attraction to the first part and control by state flow.

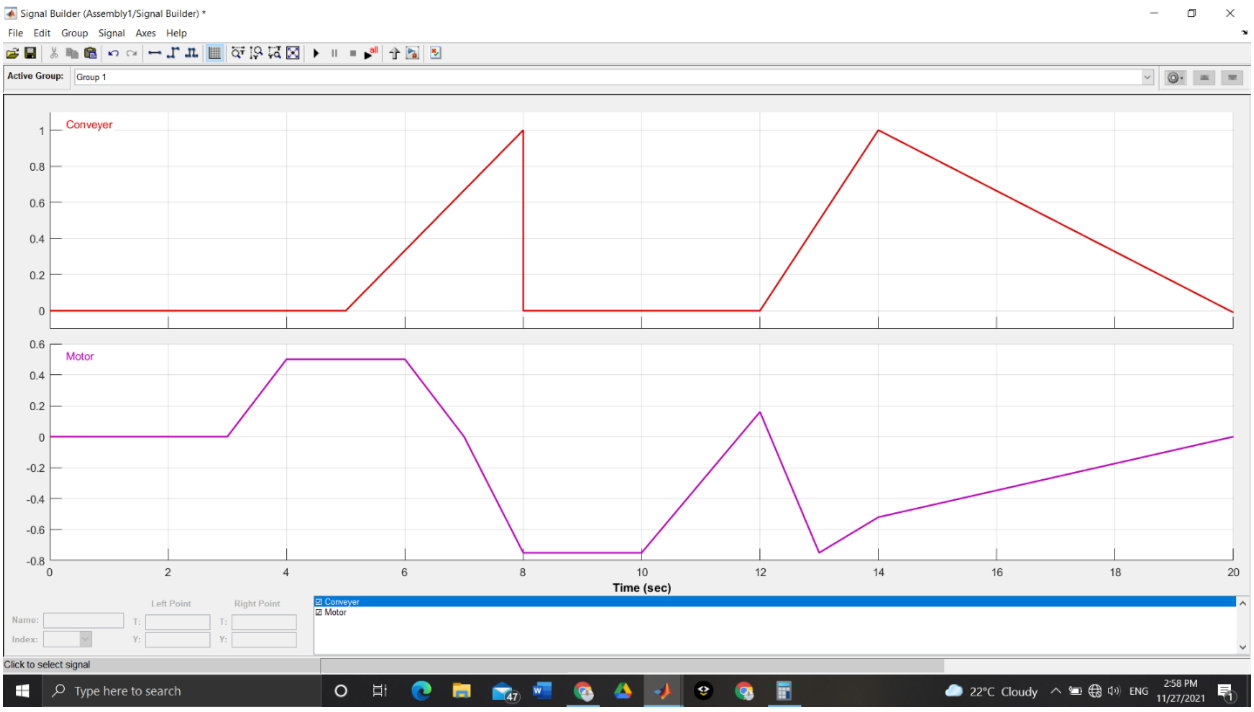


The state flow controlling the suction cup. 2 inputs: motor signal and parts connection.

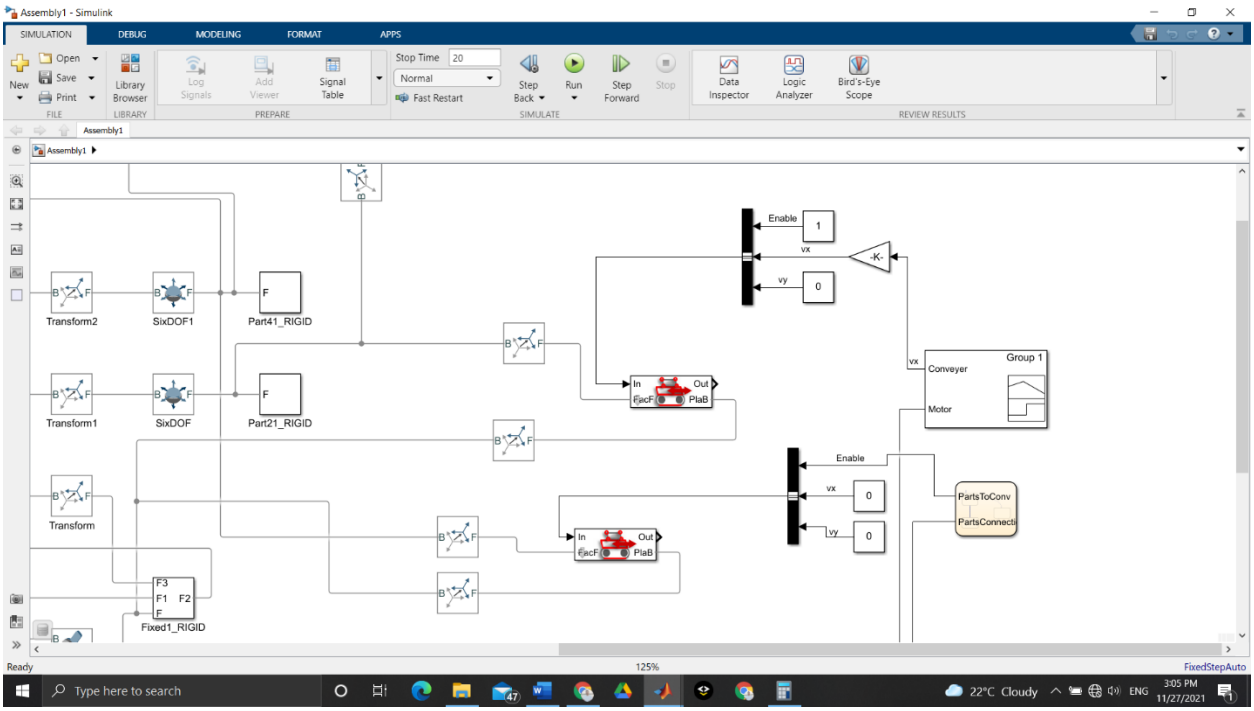


The state flow controlling the face to belt contacts of the parts between each other and the first part to the conveyer.

5. The Signals:



2 signals controlling: conveyer, motor.



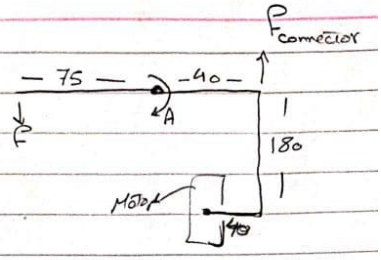
Connection of the signal converter and the face to belt to control it, the upper one are always enabled but the second one is for the part being held up with the suction cup, so it unenabled after the part is held up.

6. Actuator Sizing

$\Sigma T = J_{eq}\ddot{\theta}$

assume m_p = 100 gm , m of crank = 50gm

$\therefore P_p$ = 1.982 N



$\Sigma M_A = 0 \longrightarrow 1.982(0.075) - F_c(0.04) = 0$

$\therefore F_c$ = 3.72 N

$\omega = \frac{2\pi N}{60}$

$\therefore T_L = PL_{crank}$ = 0.1488 N.m

$J_L = \frac{1}{2}mr^2 = \frac{1}{2} \times 50\times10^{-3} \times (40\times10^{-3})^2$

$J_L = 4\times10^{-5}$ kg.m^2 , assume $J_m = J_L$

$\therefore J_{eq} = 2J_L = 8\times10^{-5}$ Kg.m^2

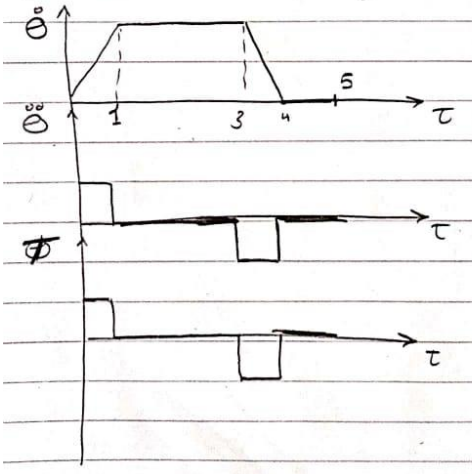
$\theta = \frac{1}{2}\left(\frac{1}{2}\times1\times\ddot{\theta}_{max}\right) + \left(2\times\dot{\theta}_{max}\right) = \frac{1}{3}\pi$

$3\dot{\theta}_{max} = \frac{1}{3}\pi$ $\therefore \dot{\theta}_{max} = \frac{1}{9}\pi$ r/s

$\ddot{\theta}_{acc} = \frac{\frac{1}{9}\pi - 0}{1} = \frac{1}{9}\pi$ r/s^2

$\ddot{\theta}_{dec} = -\frac{1}{9}\pi$ r/s^2 $\ddot{\theta}_{const} = 0$

* Motion profiles , $\theta = \frac{1}{3}\pi$



$T_m - 0.1488 = 8\times10^{-5} \times \frac{1}{9}\pi$

$\therefore T_{m_{acc}}$ = 0.14883 Nm

$\therefore T_{m_{dec}}$ = -0.14883 Nm

$\therefore N = \frac{10}{3}$ rpm → Not effective for my Servo as it moves 180° only

$\therefore T_{rms}$ = 0.0941 Nm