**PROPRIEDADES MECÂNICAS DA MONTAGEM DO PÊNDULO**

Massa = 1017.375 gramas

Volume = 1227692.311 milímetros cúbicos

Área de superfície = 425589.076 milímetros quadrados

Centro de massa: ( milímetros )

X = 0.000

Y = 96.331

Z = -0.002

Eixos principais de inércia e momentos de inércia principais: ( gramas \* milímetros quadrados )

Tomado no centro da massa.

Ix = ( 0.000, 1.000, 0.000) Px = 5471511.226

Iy = (-1.000, 0.000, 0.000) Py = 7785838.045

Iz = ( 0.000, 0.000, 1.000) Pz = 8769606.019

Momentos de inércia: ( gramas \* milímetros quadrados )

Obtido no centro de massa e alinhado com o sistema de coordenadas de saída.

Lxx = 7785838.045 Lxy = 4.264 Lxz = -0.193

Lyx = 4.264 Lyy = 5471511.241 Lyz = 227.729

Lzx = -0.193 Lzy = 227.729 Lzz = 8769606.003

Momentos de inércia: ( gramas \* milímetros quadrados )

Tomados no sistema de coordenadas de saída.

Ixx = 17226814.269 Ixy = 4.264 Ixz = -0.193

Iyx = 4.264 Iyy = 5471511.247 Iyz = 0.028

Izx = -0.193 Izy = 0.028 Izz = 18210582.222

**ESCOLHA DAS MATRIZES Q E R DO CONTROLADOR LQR**

*“The main idea in LQR control design is to minimize the quadratic cost function of int(x^TQx + u^TRu)dt. It turns out that regardless of the values of Q and R, the cost function has a unique minimum that can be obtained by solving the Algebraic Riccati Equation. The parameters Q and R can be used as design parameters to penalize the state variables and the control signals. The larger these values are, the more you penalize these signals. Basically, choosing a large value for R means you try to stabilize the system with less (weighted) energy. This is usually called expensive control strategy. On the other hand, choosing a small value for R means you don’t want to penalize the control signal (cheap control strategy). Similarly, if you choose a large value for Q means you try to stabilize the system with the least possible changes in the states and large Q implies less concern about the changes in the states. Since there is a trade-off between the two, you may want to keep Q as I (identity matrix) and only alter R. You can choose a large R, if there is a limit on the control output signal (for instance, if large control signals introduce sensor noise or cause actuator's saturation) , and choose a small R if having a large control signal is not a problem for your system.*

*Hope this is helpful.”*