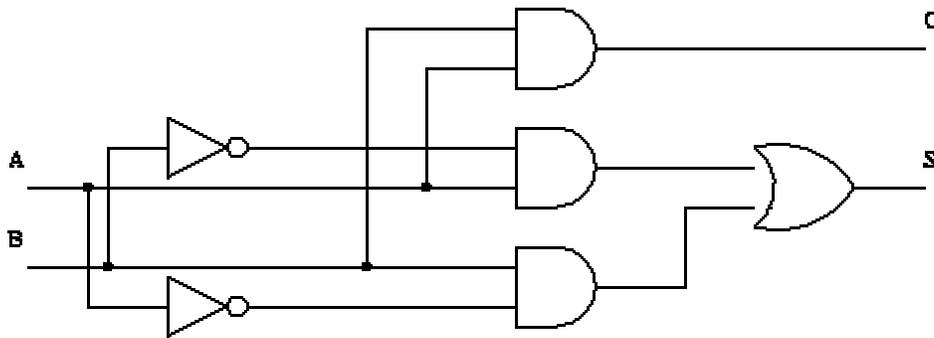


ME 285 Mechatronic System Design

Homework #8: Combinational Logic, Linear Motors, and Inertia Calculation

- For the combinational logic circuit shown below:
 - Write down the truth table for this circuit.
 - Derive the Boolean expressions for C and S in terms of A and B.
 - Simplify your expressions, if necessary, using the theorems and postulates for Boolean algebra.



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- Visit <http://www.compumotor.com/products.htm> Explain under what circumstances and why you might want to choose a linear motor over the traditional leadscrew/linear guide approach (like the one you sized the motor for in class).
- Derive the formula for J_{Load} for a gear driven load from page 6 of the Compumotor Engineering Reference (http://www.compumotor.com/literature/pdf/pg223_engrg_mtrs.pdf)
- Find the total inertia of the drive system reflected to the motor, which consists of the two pulleys, the belt, the leadscrew, and the object to be positioned.

Pulley 1: $W_1=0.16$ lb

Pulley 2: $W_2=0.35$ lb

Object: $W_3=10$ lb

Weight of belt = 0.1 lb.

Dia. of pulley 1 = 2 in.

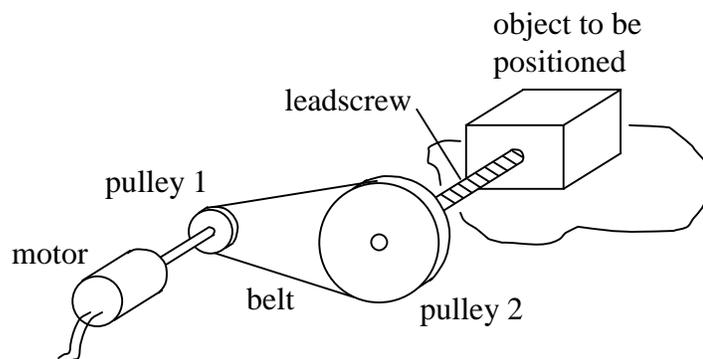
Dia. of pulley 2 = 4 in.

Leadscrew length = 1 ft.

Leadscrew diameter = 0.5 in

Leadscrew material is steel

Leadscrew pitch = 5 threads/in. (ACME thread form)



What should the inertia of the motor armature be?