

Design Exercise #3. Design of Latch/Clutch

Assigned: 11/12/12, Not to Exceed Due Date: 11/22/12

Grading:

- 15 points (style, grammar, organization),
- 10 points (quality of drawings),
- 10 points (Design Content: Calculations),
- 5 points (Design Content: Functional Requirement-Design Feature Mapping),
- 5 points (Design Content: Cost Estimates)
- 55 points (Design Content: Design Quality, Completeness, Buildability)

NOTE: all members of the same design group must design a bail for the same type of catapult.

NOTE: all members of the same design group must use the same third level functional requirements for this design feature.

The second level functional requirements for your design will be

- A) a machine frame to contain all components and allow adjustment of the range
- B) an element to store energy for release on firing and transfer that energy to the potato
- C) a automatic mechanism, actuated by the two provided servo motors, which will hold the element in B in the fully loaded position and which will decouple the gearbox (D) from the energy storage element (B)**
- D) a gearbox, actuated by the supplied DC motor, which will wind the energy storage element (B) through the coupling (C).

This design exercise is to develop a design to fulfill functional requirement C.

Constraint One: The catapult in one configuration must fit into a box 24"x24"x12" in some orientation.

Identify the third level functional requirements for FR C (call them C1, C2, ...).

Design Output: Produce a report that includes the mapping of Functional Requirements to Design Features.

Discuss special features or design decisions so as to facilitate the selection of your device for the group's build.

- Provide engineering calculations which support your decision-making process. In particular,
 - What holding force is required? What is the tensile strength (force) of your "rope"?
 - What force will be required to "pull the pin"?
 - What is the mechanical advantage of the mechanism between your servo and pin?
 - What is your clutch's normal force? What is the holding torque of your clutch?

Provide detailed engineering drawings for all parts and assembly drawings to illustrate your design concept. Drawings should be sufficient for your group to actually build the device. This is not a rough draft.

Provide an inventory of parts that need to be purchased, along with part numbers and suppliers and cost (put it in a table please).

Provide an inventory of materials that need to be purchased, along with part numbers and suppliers and cost (put it in a table please).