

## Design Exercise #2. Detailed Design of Gear-Box

Assigned: 2/17/14, Due Date: 2/21/14

### Grading:

15 points (style, grammar, organization),

25 points (quality of drawings),

0 points (Design Content: Calculations),

0 points (Design Content: Functional Requirement-Design Feature Mapping), 5 points (Design Content: Cost Estimates)

55 points (Design Content: Design Quality, Completeness, Buildability)

The second level functional requirements for your design will be

1. A) a container to hold the electronic control components (Vex microcontroller, Radio Shack circuit boards, electrical connectors, panel switches) allowing access to the components & viewing of the lights and protecting the components from environmental conditions (such as water, shock & vibration, and impact).
2. B) A frame to provide stiffness for the steering wheels, drive wheels, and to hold the controller box (A). Front and rear steering wheels must mount to either end of the frame. Pivots to attach drive wheels & suspension must be provided in the frame design.
3. C) **A gearbox to couple the drive motors to the drive wheel and which mounts to the suspension element in the Frame (B).**
4. D) A gearbox to steer the front/rear wheels. The design must accommodate a potentiometer to measure the position.

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

Constraint One: Use two FIRST CIM motors in each gear box.

Constraint Two: Use the following gear sets with gear stock from Stock Drive Products:

Stage One: 20 degree PA, 20 pitch, steel, .25" face width in contact,  $Z_i = 15$ ,  $Z_o = 60$  Stage Two: 20 degree PA, 20 pitch, steel, .7" face width in contact,  $Z_i = 18$ ,  $Z_o = 60$

Constraint Three: The gearbox must drive and contain a 9" x 2" skyway wheel which is driven through a 5/8" hex broached bore. (This means, make sure your container can accommodate a 9" diameter x 2" thick cylinder and make sure your output drive section is a 5/8" hexagonal shaft.)

Constraint Four: all bearings in the gearbox, except the bearings supporting the wheel, should be 608 sealed bearings (mcmaster-carr p/n 5972K222). The drive wheel bearings should be INA 3200 double sealed bearings (mcmaster-carr p/n 8828T311).

Design Output: Produce a report that details your design and elucidates your design decisions.

Provide detailed engineering drawings for all parts that need to be made and assembly drawings

to illustrate your design concept. Drawings should be sufficient to actually build the device.

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).