2.72 Elements of Mechanical Design

Homework #2
Gears

Due Date: Thursday 23 February, 2:30PM.

Deliverable: Individual written document, although #4 surely entails much collaboration with your lab partner. Hand in a hard copy when you come to class.

Time allotment: You should expect to spend 5 hrs on this homework beyond the 3 hrs in lab.

Assignment:

1) (Shigley and Mischke 14-2)

2) (Shigley and Mischke 14-18)

3) In class on Thursday 9 FEB, you were given a hobby servo. Make whatever observations and measurements are necessary, and use them to answer the following questions. Document your answers in whatever means you feel best communicates the issues (words, drawings, graphs, etc.):

a. What conditions will cause the spur gear on the output shaft to fail?
b. What is the means by which the desired position of the output shaft is communicated through the yellow wire?
c. When the motor output shaft is stalled, how much power is consumed by the servo (assuming a 4.8V supply)?

4) In lab on Friday 17 FEB, you and your lab partner will receive a planetary gearbox set and a double gearbox set (see pictures below). Carry out the actions listed below. Document your work in whatever means you feel best communicates the issues (words, drawings, graphs, etc.):

a. Construct the planetary gearbox in order to attain a 20:1 reduction ratio. Confirm empirically that this was attained. How did you accomplish these tasks?
b. Construct the double gearbox in order to attain a 38.2:1 reduction ratio. Confirm empirically that this was attained. How did you accomplish these tasks?
c. Based on engineering principles, form an opinion of which of the two can apply the greater stall torque. Explain your reasoning.
d. Determine empirically which of the two can apply the greater stall torque. Explain your approach.

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Tamiya Double Gearbox (Left/Right Independent 4-speed)
Tamiya Planetary Gearbox Set