**ENGR 122**   **Homework 8**

NOTE: INDIVIDUALS: Use engineering format for problems 1-3. Each student should turn in problems 1 through 3 in their own homework.

TEAMS: Complete problems 4 through 6 as a team and turn in one paper for each team in a separate stack at the front of the room. Use non-engineering format for these problems. Write the names of all team members on the paper that you turn in for the team.

1. A battery supplies a DC electric motor with 6V and 1A. The motor is attached to a gearbox and pulley system that lifts a 20 oz. weight at a rate of 1-inch per second. Determine the efficiency of the system. Complete your solution using Mathcad. 2.354%

2. Consider the gear train shown below. If the DC motor is running at 5000 RPM and can supply a maximum 0.063 in-lbf of torque, assuming 100% efficiency, determine:
    a.   The maximum weight W that the pulley can lift.1.3lbf
    b.   The velocity of the string. 25.39in/s
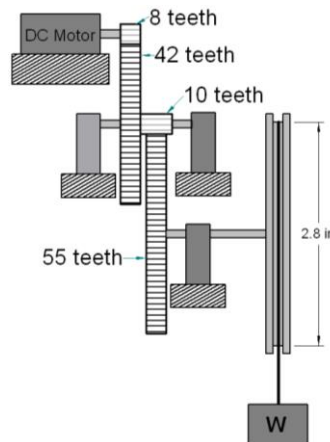
3. In the gear train shown, gear 1 has 14 teeth, gear 2 has 43 teeth, gear 3 has 22 teeth, and gear 4 has 92 teeth. A rope carrying a weight of W = 300lb is being wound at a constant rate onto a spool with a radius of r = 1 ft. The spool is directly attached to gear 4. Gears 2 and 3 are rigidly connected to each other. Assuming 100% efficient gears, what is the torque supplied by the output shaft of the motor? 23.36 ft-lbf

    Hint: Remember, you can relate torque through the gear train using the gear ratios discussed in class 6. You can also calculate torque by as Force x Distance. This expression may give you a starting point.
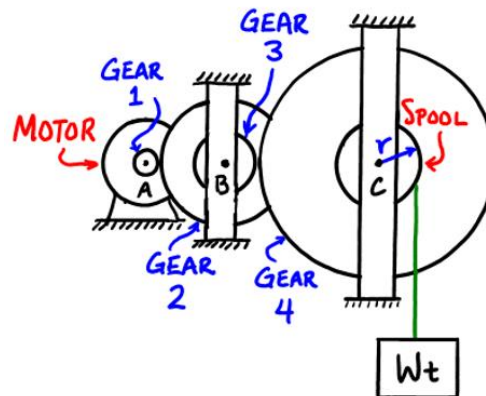
This is the start of the team homework. Please submit one paper per group. Use non-engineering format for your solutions.

4.   Meet with your team and compile a single idea list. Include ALL six of each team member's ideas that were submitted for homework. As a group, select the idea you "think" you would like to tackle for your design project, and identify this idea in your homework.

5.   Include an image of the mind map that your team created.

6.   Write a memo to your instructor defining the problem that your team would like to solve. Be careful not to try to completely solve the problem yet. We will be covering brainstorming techniques in class to help you work <u>toward</u> a better solution, and it is important that you not completely make up your mind at this point about how you will solve the problem. Keep the ideas flowing and keep an open mind at this stage of the process. The memo should be turned in with the homework but should be on its own page. ***Each team member should sign the memo.*** An example memo template is provided on the next page.

TO: Dr. X (X = name of your ENGR 122 instructor)

FROM: Team X followed by last names of team members (X = table number)

DATE: April 7, 2018

SUBJECT: ENGR 122 Design Topic – Remote Controlled Dog
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Dogs are routinely used in search and rescue operations. Many times, the space that needs to be searched covers a large land area or an area that is difficult for humans to pass. Our concept utilizes a central command center to control the movement of trained dogs over specified region through the use of RF communication and GPS technology.

Our initial idea is to design a special dog harness equipped with vibrating motors similar to those used in cell phones. When a signal is received that causes a motor on the right side of the harness to turn on, the dog will turn to the right. By controlling several vibrating motors and by relaying dog movement through RF and GPS, we believe that we can design a system that will allow a dog to cover a specific area in a systematic way. While we initially think that RF and GPS sensors would work well for this project, the actual sensors used and the design concept will likely change as we apply the IDEO design process to our problem.

No actual dogs will be tested in this project since special permissions would be required for animal use. However, an operational harness will be designed, fabricated and tested.

Signatures of Team Members:

_____   _____
Sally Doe   John Deere

_____   _____
Sam Eastwing   Janet Westwing