ENGR 122  Homework 8

NOTES: **INDIVIDUALS:** Use engineering format for problems 1 and 2 and non-engineering format for problem 3. Each student should turn in problems 1 through 3 in their own homework (if you have a partner for problem 3, then both partners should submit the solid model drawing with their homework).

**TEAMS:** Complete problems 4 through 6 as a team, and turn in one paper for each team. 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. Consider the gear train shown below. If the DC motor is running at 5000 rpm, and can supply a maximum 2 oz-in of torque, assuming 100% efficiency, determine:
   (a) The maximum weight \( W \) that the pulley can lift 41.25 oz
   (b) The velocity of the string 25.4 in/s

2. For problem 1, the DC motor outputs a maximum of 2 oz-in of torque while only 30 oz is lifted by the pulley/string due to frictional losses in the gearbox. Find the efficiency of the gearbox. \( \eta = 72.7\% \)

3. **Due on Class 9** Make an enclosure such as a box out of foam board – it’s OK to be creative with the shape. The box should have six sides so it is completely enclosed. This will build some of the skills that you may need when creating your prototype later in the quarter. Use the presentation entitled “foam core” on the Class 6 schedule for directions. Please make sure you have something under your foam board so you don’t damage desktops and other surfaces around campus (or cut outside on a concrete surface).
   **You can do this project in teams of two or individually.** Please bring your foam board creation to class 9 to show your instructor, and include a SolidWorks drawing of what you create with your homework (each student working on your foam core model should submit the SolidWorks model in their homework). We will likely run out of foam board in Ruston, so if you go home over the weekend, you might want to pick up a piece. A business that makes signs would probably sell you a piece, or you could get it at Walmart, Office Depot, the University Bookstore, Hobby Lobby, etc.
4. Meet with the other members in your group, and compile a single bug list for your group. Include ALL seven of each group member’s bugs. As a group, select the bug you “think” you would like to tackle for your design project, and identify this bug in your homework.

5. With your team, create a mind map for the favorite bug on the team’s bug. Include at least five offshoots. A couple of the offshoots should have several sub-offshoots.

6. With your team, write a memo to your instructor defining the problem (bug) you would like to solve with your ENGR 122 design project. Be careful not to try to completely solve the problem yet. We will be covering brainstorming techniques in class to help you work toward 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. An example memo is provided below.

<table>
<thead>
<tr>
<th>TO:</th>
<th>Dr. X (X = name of your ENGR 122 instructor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM:</td>
<td>Team X followed by last names of team members (X = table number)</td>
</tr>
<tr>
<td>DATE:</td>
<td>April 7, 2008</td>
</tr>
<tr>
<td>SUBJECT:</td>
<td>ENGR 122 Design Topic – Remote Controlled Dog</td>
</tr>
</tbody>
</table>

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