

# 2.000 Lab # 2 – Tecumseh Transmission

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Name: \_\_\_\_\_

Section: T      R      (circle one)

Weight: 120 pts

## Tecumseh Transmission

### **PURPOSE:**

The lab is designed to provide practice in determining gear train ratios. It sets a general foundation for understanding how/why geared mechanisms work.

### **IMPORTANCE:**

Gears are one of the most common means for transferring energy/power in machines. The knowledge and skill you develop in this lab will be put to good use during the test, final class project and career.

### **TIME:**

You have ~ 2 hrs 15 minutes to disassemble the transmission and work on the lab write up. At 2 hrs 15 minutes, everyone must reassemble their transmission. Do this carefully and correctly as reassembly weighs heavily on your grade!!! The write up is due at the beginning of next lab.

### **SAFETY:**

You **MUST WEAR SAFETY GLASSES AT ALL TIMES!!!** Failure to do so may result in your dismissal from lab.

**REMAIN CLEAR OF GEARS WHILE THEY ARE DRIVEN BY THE DRILL  
SHAFTS HAVE SHARP EDGES, USE GLOVES WHEN HANDLING THEM**

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## ORGANIZATION

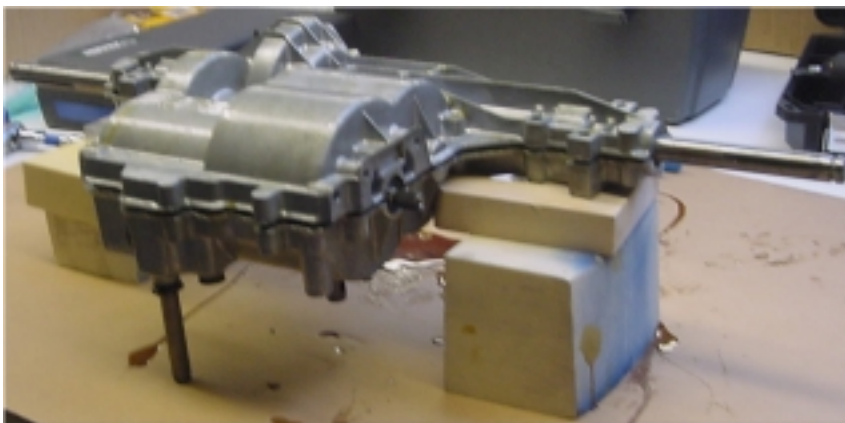
Organization will help you finish on time. You might like to rotate the following tasks between group members:

- READ THE LAB - GUIDE
- KEEP TRACK OF TOOLS & PARTS - ORGANIZE
- WORK – DISASSEMBLE

## CAREFUL AND CLEAN

[ 2 pts ] Before you split the transmission in two parts (like a clam shell). Look at the joint between the two halves. Do you find anything which may warn you to be careful when opening the cases? Explain in 1 sentence.

**Mount the transmission to the wooden blocks with wood screws. Use the cordless drill and screw driver attachment. Then remove the bolts from the transmission using a socket/ratchet assembly or one of the cordless drills.**



**Screw/fasten to wood blocks for easier handling**



**Ratchet assembly**

**Before you disassemble ANYTHING else, you should take time to learn what you can about the 5 areas of the UHTW model through the following questions...**

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### UHTW-I: FORM ( Less than 15 minutes )

[24 pts] Sketch the transmission in moderate detail. You should label/name the major features, i.e. left wheel axle, right wheel axle, shaft A, shaft B, etc... so that you may refer back to these sketches when you are finishing the write up. It is likely that you will have to return to this sketch to add details as you do the write up. You will be graded on:

Size	Proportion	Likeness	Notes/Explanation
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UHTW-I: FORM cont....( Less than 15 minutes )

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### UHTW-II: FUNCTION

[ 1 pt ] What is the function of this transmission?

### UHTW-III: FLOWS

[ 3 pts each ] Describe the major flows inside, into, and out of the transmission. Explain where these occur. Use simple sketches.

<u>FLOW</u>	<u>FROM/THRU/TO</u>	<u>DESCRIPTION</u>

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## UHTW-IV: PHYSICS

[ 4 pts each ] Explain the physics that can be used to model the machine. No credit if you don't relate the form and/or flow(s) to the physics.

Bad answer:  $E = \int F \cdot dx$  Force is applied through a distance

Good answer:  $E_{m-button} = \int F_{button} \cdot dx_{button}$  User does work on button when taking picture

### Dominant Physics (models behavior that dominates machine function)

<u>Sketch/Flow</u>	<u>Equation</u>	<u>How sketch/physics relate</u>

### Limiting Physics (what limits the performance of the machine, i.e. strength)

<u>Sketch/Flow</u>	<u>Equation</u>	<u>How sketch/physics relate</u>

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### UHTW-V: FABRICATION

[1 pts each] List three things which identify the case of the transmission as a die cast part.  
Use a sketch to explain.

[2 pts ] Can the halves of the transmission case be made with a two piece mold? Explain.

[ 2 pts each] Use words and sketches of the transmission to identify two (not casting) manufacturing processes that were used to make parts of the transmission.

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## SHAFT FUNCTIONS

[ 2 pts each] There are multiple shafts which protrude from the casing of the transmission.

Describe the function of each shaft (in say 3 - 4 words). You may do this on a rough sketch. Don't spend over 2 minutes on the sketch. Make sure you identify the input and output shafts.

**SHAFTS HAVE SHARP EDGES, USE GLOVES WHEN HANDLING THEM**



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### TRAIN RATIOS

[ 1 pt each ]

**DISASSEMBLE THE TRANSMISSION AS YOU SEE FIT TO ANSWER THE FOLLOWING QUESTIONS**

Determine the train ratio for each gear setting. You will need to count the number of teeth on each gear to answer this question. Make sure you convey which gear train ratios belong to which gear settings (SKETCH!!!)

[ 2 pts ] Why is it possible to change speed ratios when many sets of gears, all of different ratios, are in contact? Call an instructor/TA to set up the drill if you want to run the transmission and observe. **STAY CLEAR OF GEARS WHILE THEY ARE DRIVEN BY THE DRILL**

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### TRAIN RATIOS CONT.

[ 15 pts ] Disassemble the gears train used to shift the transmission. Describe with a detailed sketch (less than 15 minutes) how the shifting is accomplished. Is there a linkage involved?

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### DIFFERENTIAL

A differential makes it possible to transfer power from a power source to two separate shafts while allowing the output shafts to rotate at different speeds. You should examine this mechanism and answer the following questions. NOTE: You will be required to have a differential in your second project!!! Part of your responsibility in the second project will be to figure out how to model the differential...

**THE SHAFT END HAVE SHARP EDGES, USE GLOVES WHEN HANDLING THE SHAFTS/SHARPS**

STEPS FOR OBSERVING THE FUNCTION OF THE DIFFERENTIAL:

- A. Remove the gear which connects the differential to the main gear train.
- B. Turn the axles in opposite directions.
- C. Turn the axles in the same direction, but with one rotating faster than the other.
- D. Rotate the axles in the same direction at the same speed.

[ 2 pt ] What is the minimum number of differentials required for a 4wd vehicle? Explain.

[ 1 pt ] What is the minimum number of differentials required for a 2wd vehicle? Explain.

### REASSEMBLY [ 20 pts ]