

BE1010 – Fall 2004

Prof. Mohamad Hassoun, WSU

Quiz # 4 (15 minutes. You may use only the course webpage)

- I. (10 points) Consider the following gearing assembly consisting of three 8t and three 24t gears. Find the gear ratio. Does this gear train gear up or down? How many turns should the 8t driver gear turn so that the 24t output gear makes 2 full turns.

Gear Ratio: 8t/24t = 1:3 ratio

$$1/3 \times 1/1 \times 1/3 \times 1/1 \times 1/3 = 1/27 \quad \text{GR} = 1:27$$

$1/27 < 1$, so it is geared down

of turns of follower gear / # of turns of driver gear = GR = 1/27

Therefore, # of turns of driver gear = $27 \times 2 = 54$

- II. Consider the following Lego wheel assembly where the motor drives a worm gear positioned vertically. The worm gear engages a 24t gear. The wheel and the 24t gear share the same axle. Assume the motor spins 200 revolutions per minute and that the wheel diameter is 8.15 cm. Calculate the distance (in meters) covered by this wheel assembly in one minute.

- 200 rpm x 1 min = 200 rotations

- worm gear to 24t gear ratio is 1:24

- the axle rotates $200/24 = 8.333$ times in one minute

- the wheel circumference is $\pi \times d = 3.14 \times 8.15 \text{ cm} = 25.6 \text{ cm}$

- the distance it will travel is: $25.6 \text{ cm} \times (1 \text{ m}/100 \text{ cm}) \times 8.333 = \boxed{2.13 \text{ meters}}$