General H.H. Arnold High School

Professional Technical Studies

Robotics and Mechanical Engineering (VEE406)

Gears, LEGOs, and Simple Machines - Practical Examination

Instructions – This exam is an individual effort meaning "*One person… One machine*." Read the design problems listed below and build your solution machine. As you complete each machine, have the instructor inspect and evaluate your machine.

( ) 1. Build a manually driven gear reduction system using a worm gear and multiple stages of other gears to produce a gear ratio of 200:1.

( ) 2. Build a motorized mechanism that converts rotary motion into reciprocal motion.

( ) 3. Build a motorized worm gear or chain/sprocket transmission for a four wheeled vehicle with a gear ratio of at least 80:1.

( ) 4. Using no rubber bands or string, build a LEGO container that holds a paper cup and be dropped from a distance of 1 meter without breaking.

( ) 5. Build a steering mechanism for a four wheeled vehicle.

( ) 6. Using no gears or sprockets, build a motorized mechanism that will join four axles end-to-end with the end segments being parallel.

( ) 7. Build a machine that grasps a paper cup around its diameter. The machine should close its grippers by turning a single axle. The machine must include a mechanism that prevents the cup from being crushed.

( ) 8. Build a four legged motorized machine that walks at least 20 centimeters.

( ) 9. Build a motorized model of a ski gondola using a pulley belt transmission. The transmission must increase torque to at least 9:1. The gondola should travel back and forth on 5% incline a taught string 1 meter in length.

( ) 10. Build a mechanism that triggers a rubber band sling-shot to shoot a paper wad 2 meters away.

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Last Name, First Student Number Period Date