HW 3: Economic Analysis

ISE 453: Design of PLS Systems **Spring 2020**

Names: _____ Unity ID: _____20 Feb, due 27 Feb

1. A machine has an initial purchase cost of $2,500,000, a trade-in value equal to 20% of its initial cost at the end of 12 years, and an operating cost of $125 per unit produced. Assuming that the machine will be used to produce 2,500 units per year and a real cost of capital of 4% compounded annually, what is the cost per unit?

2. A car has an initial purchase cost of $35,000, a trade-in value equal to 35% of its initial cost at the end of five years, and an operating cost of $0.075 per mile. Assuming that the car will be driven 15,000 miles per year for five years, a nominal cost of capital of 7% compounded annually, and a current rate of inflation of 3%, what is the cost per mile for the car?

3. A firm is considering replacing a manual machine with a fully automated machine in order to reduce the direct labor required per unit from 45 to 12 minutes for the 50,000 units produced each year. What is the payback period of this change assuming that the automated machine will cost $1 million and the manual machine can sold for $100,000, and the fully burdened direct labor cost is $35 per hour?

4. A firm is currently considering two widget machines. The first machine is highly automated and has an initial investment cost of $850,000, a salvage value equal to 30% of its initial investment cost at the end of ten years, and an operating cost of $120 per unit. The second machine is a low-tech machine automated and has an initial investment cost of $150,000 with no salvage value at the end of ten years and an operating cost of $145 per unit. Assuming a real cost of capital of 5% compounded annually, what is the range of annual demands that would result in the low-tech machine having a lower total cost than the highly automated machine?