TIE2140 Engineering Economy
Assignment #6
Due: 12 April 2024, 9 pm

You may use Excel or any computing tools for your calculations, but you must explain or show relevant formulas or equations in your solutions. Submit your completed assignment anytime into the Drop Box outside the ISEM Department Office at E1A-06-25, or to the professor at the end of the lecture.

Three years ago, a manufacturing company purchased a machine for $8,888 for its quality control department. The management is now considering replacing this machine (defender) with a new one (challenger).

The existing machine has a current market value of $4,000 and a remaining useful life of 4 years. If the machine is not replaced, its annual operating costs will be $2,000 in the coming year and will increase by $1,500 per year. Its market value will decline by 25% each year over the previous year's value.

The new machine being considered costs $10,000 and its annual operating costs will be $2,200 in the first year and increase by 20% per year thereafter. The market value is $6,000 after one year and will decline 15% each year. The useful life of the new machine is 6 years.

The company's *MARR* is 12%. The effects of income taxes do not need to be considered in this problem.

(*a*) What is the economic service life of the challenger and optimal EUAC? What does this "economic service life" mean? (5 marks)

(*b*) If the study period is infinity determine the optimal replacement plan and EUAC in real cash flow terms. Explain your answers and state the major assumptions made. (5 marks)

(*c*) If the study period is 1 year, determine the optimal replacement plan and EUAC in real cash flow terms. Explain your answers and state the major assumptions made. (4 marks)

(*d*) If the study period is 4 years, determine the optimal replacement plan and EUAC in real cash flow terms. Assume that the challenger can be repeated only once. (6 marks)