Name: KEY **Id#**

ISE 307, Term 153
ENGINEERING ECONOMIC ANALYSIS

Quiz# 3

Date: Monday, August 15, 2016

Q1. The owner of a business is considering investing $80,000 in new equipment. He estimates that the net cash flows will be $8,000 during the first year and will increase by $2,000 per year each year thereafter. The equipment is estimated to have a 10-year service life and a net salvage value at the end of this time of $10,000. The firm's interest rate is 15%.

a. Determine the annual capital cost (ownership cost) for the equipment.

CR(15%) = (80,000-10,000)(A/P, 15%, 10) + 0.15*10,000
= 70,000*0.1993 + 1,500
= $15,451

b. Determine the equivalent annual savings (revenues).

$AE_{savings}$(15%) = 8,000 +2,000 (P/G, 15%, 10)(A/P, 15%, 10)
= 8,000 + 2,000*16.9795*0.1993
= $14,768.03

OR

$AE_{savings}$(15%) = 8,000 +2,000 (A/G, 15%, 10)
= 8,000 + 2,000*3.3832
= $14,766.4

c. Determine whether this investment is wise.

AE(15%) = 14,768.03 - 15,451 = -$682.97

So, this investment is not wise.

Q2. Consider the following investment projects:

n	Project 1	Project 2
0	-$1,200	-$2,000
1	800	1,500
2	900	1,100
IRR	26.13%	20.60%

Determine the range of MARR for which Project 2 would be preferred over Project 1.

n	Project 2 - Project 1
0	-$800
1	700
2	200

$PW_{2\text{-}1} = -800 + 700(1 + IRR_{2\text{-}1})^{-1} + 200(1 + IRR_{2\text{-}1})^{-2} = 0$

Let $X = (1 + IRR_{2\text{-}1})^{-1}$

- ⇨ $-800 + 700X + 200X^2 = 0$
- ⇨ $-8 + 7X + 2X^2 = 0$
- ⇨ $X = 0.9075$ OR $X = -4.4075$
- ⇨ $(1 + IRR_{2\text{-}1})^{-1} = 0.9075$
- ⇨ $1 + IRR_{2\text{-}1} = 1.1019$
- ⇨ $IRR_{2\text{-}1} = 0.1019 = 10.19\%$

Project 2 would be preferred over Project 1 for MARR < 10.19