Name: KEY Id#

ISE 307, Term 153

ENGINEERING ECONOMIC ANALYSIS

Quiz# 3

Date: Monday, August 15, 2016

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# **Q1.** You invest in a piece of equipment costing $100,000. The equipment will be used for three years, and it will be worth $20,000 at the end of three years. The machine will be used for 4,000 hours during the first year, 5,000 hours during the second year and 6,000 hours during the third year. The expected annual savings associated with the use of the piece of equipment will be $30,000 for the first year, $40,000 for the second year and $50,000 for the third year. Your interest rate is 10%.

1. What is the capital recovery cost?

(10%) = (100,000 – 20,000)(𝐴/𝑃, 10%, 3) + 0.1 \* 20,000

= 80,000\*0.4021 + 2,000

= $34,168

1. What is the annual equivalent worth?

AEsavings(10%) = [30,000(𝑃/𝐹, 10%, 1) + 40,000(𝑃/𝐹, 10%, 2) + 50,000(𝑃/𝐹, 10%, 3)](𝐴/𝑃, 10%, 3)

= [30,000\*0.9091 + 40,000\*0.8264 + 50,000\*0.7513]\*0.4021

= 97,894\*0.4021 = $39,363.18

AE(15%) = 39,363.18 - 34,168= $5,195.18

1. What is the net savings generated per machine-hour?

Let C be savings per machine hour

Then, AE(15%) = 4000C(𝑃/𝐹, 10%, 1) + 5000C(𝑃/𝐹, 10%, 2) + 6000C(𝑃/𝐹, 10%, 3)](𝐴/𝑃, 10%, 3)

= [4,000C\*0.9091 + 5,000C\*0.8264 + 6,000C\*0.7513]\*0.4021

= 12,276.2C\*0.4021= 4,936.26C

Thus, C = 5,195.18/4,936.26 = $1.05 per machine hour

# **Q2.** Consider the following investment projects:

|  |  |  |
| --- | --- | --- |
| *n* | Project 1 | Project 2 |
| 0 | -$6,000 | -$7,500 |
| 1 | 1,000 | 1,000 |
| 2 | 1,400 | 2,000 |
| 3 | 3,000 | 3,000 |
| 4 | 2,900 | 4,000 |
| IRR | 11.916% | 10.242% |

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

|  |  |
| --- | --- |
| *n* | Project 2 - Project 1 |
| 0 | -$1,500 |
| 1 | 0 |
| 2 | 600 |
| 3 | 0 |
| 4 | 1,100 |

PW2-1=-1,500 + 600(1 + 𝐼𝑅𝑅2-1)−2+ 1,100(1 + 𝐼𝑅𝑅2-1)−4 = 0

Let X = (1 + 𝐼𝑅𝑅2-1)−2

* -1,500 + 600 X + 1,100 X2 = 0
* -15 + 6X + 11X2 = 0
* X = 0.9264 OR X= -1.4719
* (1 + 𝐼𝑅𝑅2-1)−2 =0.9264
* (1 + 𝐼𝑅𝑅2-1)2 = 1.0794
* 1 + 𝐼𝑅𝑅2-1 = 1.03896
* 𝐼𝑅𝑅2-1 = 0.03896 = 3.896%

Project 2 would be preferred over Project 1 for MARR < 3.896