Name…………………………… ……………………………Code……………

# PRINCE OF SONGKLA UNIVERSITY
# FACULTY OF ENGINEERING

| | |
|---|---|
| Final Examination: Semester 1 | Academic Year: 2011 |
| Date:  04/10/2011 | Time:  13:30-16:30 |
| Subject: 225-346 Engineering Economy | Room: S101, S103, S203 |

## Instructions

- There are 8 questions and 2 extra questions (10 pages).
- Total score is 102.
- Answer all questions.
- Dictionary, calculators, books and lecture-notes are allowed.

### ลูกวิศวะดงยางมีศักดิ์ศรี  ยอมติด E ดีกว่าทุจริต

### ข้าพเจ้าจะซื่อสัตย์ในการสอบ

ลงชื่อ……………………………… ตอน………หมายเลขที่นั่งสอบ…………

### ทุจริตในการสอบโทษขั้นต่ำคือปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Good luck
Sakesun Suthummanon

| Question | Score | |
|---|---|---|
| 1 | 5 | |
| 2 | 15 | |
| 3 | 20 | |
| 4 | 10 | |
| 5 | 20 | |
| 6 | 5 | |
| 7 | 10 | |
| 8 | 15 | |
| Extra | 1 | |
| Extra | 1 | |
| Total | 102 | |

1

Name............................... ...........................Code..............

**Question 1**: Three mutually exclusive design alternatives are being considered. The estimated cash flows for each alternative are given in the table. The MARR is 20% per year. At the conclusion of the useful life, the investment will be sold.

|  | A | B | C |
|---|---|---|---|
| Investment cost | $28,000 | $55,000 | $40,000 |
| Annual expenses | $15,000 | $13,000 | $22,000 |
| Annual revenues | $23,000 | $28,000 | $32,000 |
| Market value | $6,000 | $8,000 | $10,000 |
| Useful life | 10 years | 10 years | 10 years |
| IRR | 26.4% | 24.7% | 22.4% |

A decision-maker can select one of these alternatives or decide to select none of them. Make a recommendation using the PW method.

**PW of A =**.................................

**PW of B =**.................................

**PW of C =**.................................

**Select**.................**Because**..............................................................

2

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Name……………………………… ……………………….Code……………

**Question 2**: Consider the three mutually exclusive projects that follow.  The firm's MARR is 10% per

year.

| End Of Year | Project 1 | Project 2 | Project 3 |
|---|---|---|---|
| 0 | -$10,000 | -$8,500 | -$11,000 |
| 1-3 | $5,125 | $4,450 | $5,400 |

a. Calculate each project's PW.

    **PW of Project 1 =…………………………..**

    **PW of Project 2 =…………………………..**

    **PW of Project 3 =…………………………..**

b. Determine the IRR of each project.

    **IRR of Project 1 =…………………………..**

    **IRR of Project 2 =…………………………..**

    **IRR of Project 3 =…………………………..**

c. Which project would you recommend?

    **Answer =………………………….. Because………………………………………….**

d. Why might one project have the highest PW while a different project has the largest IRR?

    **Answer =…………………………………**

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**Question 3**: Three mutually exclusive alternatives are being considered. The estimated cash flows for each alternative are given in the table. The study period is 30 years and the firm's MARR is 20% per year.

|  | Alt.1 | Alt.2 | Alt.3 |
|---|---|---|---|
| Capital investment | $30,000 | $60,000 | $40,000 |
| Annual costs | 16,000 | 30,000 | 25,000 |
| Annual revenues | 28,000 | 53,500 | 38,000 |
| Market value at end of useful life | 10,000 | 10,000 | 10,000 |
| Useful life (years) | 5 | 5 | 6 |
| IRR | 33.0% | 29.9% | 26.0% |

Use the internal rate of return method to make a recommendation. State all assumptions to support your analysis.

**Answer =**……………………………………

4

**Question 4**: A piece of production equipment is to be replaced immediately because it no longer meets quality requirements for the end product. The two best alternatives are a used piece of equipment (E1) and a new automated model (E2). The economic estimates for each are shown in the accompanying table.

|  | Alt. E1 | Alt. E2 |
|---|---|---|
| Capital investment | $14,000 | $65,000 |
| Annual expenses | $14,000 | $9,000 |
| Useful life (years) | 5 | 20 |
| Market value (at end of useful life) | $8,000 | $13,000 |

The MARR is 20% per year.

a. Which alternative is preferred, based on the repeatability assumption?

   **Answer =**…………………………………

b. Show, for the coterminated assumption with a five-year study period and an imputed market value for Alternative E2 is $61,590.

   **Answer =**…………………………………

**Question 5**: A city water department has a four - year – old sludge pump that was initially purchased for $65,000. This pump can be kept in service for an additional four years, or it can be sold for $35,000 and replaced by a new pump. The purchase price of the replacement pump is $50,000. The projected MVs and operating and maintenance costs over the four-year are shown in the table. Assuming the MARR is 10%.

| Year | MV at EOY of defender | O&M cost at EOY of defender | MV at EOY of challenger | O&M cost at EOY of challenger |
|------|------------------------|------------------------------|--------------------------|-------------------------------|
| 1 | 25,000 | 18,500 | 40,000 | 13,000 |
| 2 | 21,000 | 21,000 | 32,000 | 15,500 |
| 3 | 17,000 | 23,500 | 24,000 | 18,000 |
| 4 | 13,000 | 26,000 | 16,000 | 20,500 |

a. Determine the economic life of the challenger.

Answer =………………years,  EUAC =…………………

b. Determine when the defender should be replaced.

Answer =…………………………Because……………………………………………………

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**Question 6**: A city plans a pipeline to transport water from a distant watershed area to the city. The pipeline will cost $10 million and have an expected life of seventy years. The city anticipates it will need to keep the water line in service indefinitely. Compute annual worth assuming 10% interest.


**Answer =…………………………………**

**Question 7**: A manufacturing plant has reached full capacity. The company must build a second plant either small or large at a nearby location. The demand is likely to be high or low. The probability of low demand is 0.3. If demand is low, the large plant has a present value of $5 million and the small plant, $8 million. If demand is high, the large plant pays off with a present value of only $10 million. However, the small plant can be expended later if demand proves to be high, for a present value of $14 million.

       a. Draw a decision tree for this problem

       b. What should management do to achieve the highest expected payoff?

       **Answer =**…………………………………

**Question 8**: A small commercial pump is being considered for abandonment. The pump has the following net cash flows and estimated MV (abandonment value of pump) over its useful life. Determine the optimum period for pump to be abandoned if it was acquired for $5,500 and its useful life should not be more 4 years. MARR for the firm is 10% per year.

|                | End of year 1 | End of year 2 | End of year 3 | End of year 4 |
|----------------|---------------|---------------|---------------|---------------|
| Annual benefits | $500          | $600          | $750          | $900          |
| Estimated MV    | $4,000        | $3,500        | $3,000        | $2,500        |

   **Answer =………………………………**

**Extra 1:** ให้ท่านเสนอแนะการปรับปรุงการเรียนการสอนของรายวิชา **Engineering Economy**

**Extra 2:** ท่านมีความคิดเห็นอย่างไรกับโครงการ **Entertainment Complex** ของรัฐบาล