PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 1   Academic Year: 2005
Date: October 11, 05.   Time: 13.30 – 16.30
Subject: 225-345 Engineering Economy   Room: A 401

Instructions

- There are 7 questions and 1 extra credit question (12 pages).
- Total score is 105.
- Answer all questions.
- Dictionary, calculators, computers, books and lecture-notes are allowed.

ด้วยเกียรติและศักดิ์ศรี ข้าพเจ้าจะซื่อสัตย์ในการสอบ

ลงชื่อ...ตอน...........

ทุจริตในการสอบโทษขั้นต่ำคือปรับตกในรายวิชาที่ทุจริต และพัก

การเรียน 1 ภาคการศึกษา

Good luck
Sakesun Suthummanon

1. Assume that you are planning to invest money at 10% per year as shown in the following figure. Further, you expect to withdraw according to the decreasing gradient shown. Find the net present worth and equivalent annul series for the entire cash flow sequence and interpret the results.

(10 points)
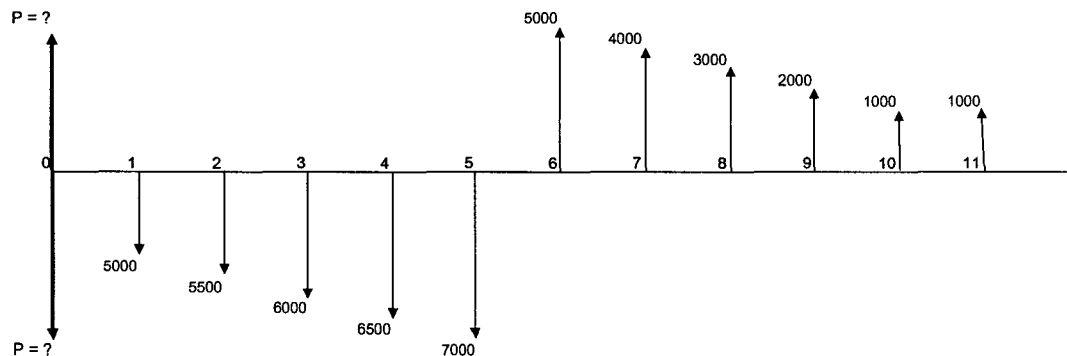
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2. An engineer just purchased new machine for $6,000 now and annual payments of $100 per year for 6 years starting 3 years from now for annual upgrades. What is the present worth of the payments if the interest rate is 10% per year?

(10 points)

3. The maintenance cost for a certain machine is $1000 per year for the first 5 years and $2000 for the next 5 years. At an interest rate of 10% per year, compute the present worth of maintenance cost.

   (10 points)

4. An environmental engineer is considering three methods for disposing of a non-hazardous chemical sludge: land application, fluidized-bed incineration, and private disposal contract. The details of each method are shown below. Determine which has the least cost on the basis of an annual worth comparison at 10% per year.

	Land Application	Incineration	Contract
First cost, $	110,000	800,000	0
Annual cost $/year	95,000	60,000	190,000
Salvage value, $	15,000	250,000	0
Life, years	3	6	2

(10 points)

5. A mobile company wants to build a spare parts storage facility in Thailand. A plant manager has identified four different location options: Songkla, Yala, Naratiwat, and Pattani. Initial cost of building, and annual net cash flow estimation are detailed in the following table. The annual net cash flow series vary due to differences in maintenance, labor costs, transportation charges, etc. If the MARR is 10%, which is the most economically location?

	Songkla	Yala	Naratiwat	Pattani
Initial cost, $	200,000	275,000	190,000	350,000
Annual cash flow, $	22,000	35,000	19,500	42,000
Life, years	30	30	30	30

(25 points)

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6. White Valley Ski Resort is planning the ski lift operation for its resort. Management is trying to determine whether one or two lifts will be necessary; each lift can accommodate 250 people per day. Skiing normally occurs in 14-week period from December to April, , during which the lift will operate seven days per week. The first lift will operate at 90% capacity if economic conditions are bad, the probability of which is believed to be about 0.3. During normal times the first lift will utilized at 100% capacity, and the excess crowd will provided 50% utilization of the second lift. The probability of normal time is 0.5. Finally, if times are really good, the probability of which is 0.2, the utilization of second lift will increase to 90%. The equivalent annual cost of installing a new lift, recognizing the time value of money and the lift's economic life, is $50,000. The annual cost of installing two lifts is only $90,000 if both are purchased at the same time. If used at all, each lift costs $200,000 to operate, no matter how low or high its utilization rate. Lift tickets cost $20 per customer per day. Should the resort purchase one lift or two.

(25 points)

Name…………………………… …………………………….Code……………

7. The Forsite Company is screening three ideas for new services. Resource constraints allow only one idea to be commercialized at the present time. The following estimates have been made for the five performance criteria that management believes to be most important.

Performance criteria	Rating		
	Service A	Ssevice B	Service C
Capital equipment investment required	0.6	0.8	0.3
Expected return on investment (ROI)	0.7	0.3	0.9
Compatibility with current workforce skills	0.4	0.7	0.5
Competitive advantage	1.0	0.4	0.6
Compatibility with EPA requirement	0.2	1.0	0.5

a) Calculate a total weighted score for each alternative. Use a preference matrix and assume equal weights for each performance criteria. Which alternative is best? Worst?

b) Suppose that the expected ROI is given twice the weight assigned to each of the remaining criteria. (Sum of weights should remain the same as in part a). Does this modification affect the ranking of the three potential services?

(10 points)