

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

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Mid-term Examination: Semester 1

Academic Year: 2006

Date: July 31, 06.

Time: 13.30 – 16.30

Subject: 225-345 Engineering Economy

Room: A400

Instructions

- There are 8 questions (8 pages).
- Total score is 100.
- Answer all questions.
- Dictionary, calculators, computers, books and lecture-notes are allowed.

ด้วยเกียรติและศักดิ์ศรี ข้าพเจ้าจะขอสัตย์ในการสอบ
และจะประพฤติตนเป็นคนดีมีจริยธรรมเพื่อเป็นแบบอย่างที่ดีต่อผู้นำที่มีความ
บกพร่องด้านคุณธรรมและจริยธรรม

ลงชื่อ.....ตอน.....

ทุจريتในการสอบโทษขั้นต่ำคือปรับตกในรายวิชาที่ทุจريت และพัก
การเรียน 1 ภาคการศึกษา

Good luck
Sakesun Suthummanon

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1. A machine part is manufactured at a unit cost of \$0.50 for material and \$0.20 for direct labor. Overhead cost is 2.5 times of direct labor cost. An investment of \$500,000 in tooling is required. The order calls for three million pieces. Half way through the order, a new method of manufacture can be put into effect which will reduce the unit costs to \$0.35 for material and \$0.15 for direct labor. However, it will require \$100,000 for additional tooling and the overhead cost is 2.0 times of the direct labor cost. Which alternative should be selected? (20 points)

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2. The owner of a small machine shop has just lost one of his larger customers. The solution to his problem, he says, is to fire three machinists to balance his workforce with his current level of business. The owner says it is a simple problem with simple solution. The three machinists disagree. What do you think? Explain. (5 points)

3. An electric motor on a conveyor burned out. The foreman told the plant manager that the motor had to be replaced. The foreman indicated that "there are no alternatives," and asked for authorization to order the replacement. In this situation, what are your recommendations for the plant manager? Explain. (5 points)

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4. ABC Corporation is currently manufacturing an item at variable costs of \$5.00 per unit. Annual fixed costs of manufacturing this item are \$140,000. The current selling price of the item is \$10.00 per unit, and the annual sales volume is 30,000 units.

a) ABC can substantially improve the item's quality by installing new equipment at additional annual fixed costs of \$60,000. Variable costs per unit would increase by \$1.00, but, as more of the better quality product could be sold, the annual volume would increase to 50,000 units. Should ABC buy the new equipment and maintain the current price of the item? Why or why not?

b) Alternatively, ABC could increase the selling price to \$11.00 per unit. However, the annual sale volume would be limited to 45,000 units. Should ABC buy the new equipment and raise the price of the item? Why or why not?

(20 points)

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5. A firm is planning to manufacture a new product. The sales department estimates that the quantity that can be sold depends on the selling price. As the selling price is increased, the quantity that can be sold decreases. Numerically they estimate:

$$P = \$35 - 0.02Q$$

Where P = Selling price per unit

Q = Quantity sold per year

On the other hand, the management estimates that the average cost of manufacturing and selling the product will decrease as the quantity sold increases. They estimate

$$C = \$4 Q + \$8000$$

Where C = Cost to produce and sell Q per year

The firm's management wishes to produce and sell the product at the rate that will maximize profit, that is, where income minus cost is maximum. What quantity should they plan to produce and sell per year?

(20 points)

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6. You have agreed to loan a friend \$10,000 for five years at a simple interest rate of 10% per year? How much interest will you receive from the loan? How much will your friend pay you at the end of five years? (5 points)

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7. Taksin Manufacturing has been purchasing a key component of one of its products from a local supplier. The current purchase price is \$1,500 per unit. Efforts to standardized parts have succeeded to the point that this same component can now be used in five different products. Annual component usage should increase from 150 to 750 units. Management wonders whether it is time to make the component in-house, rather than to continue buying it from the supplier. Fixed costs would increase by about \$40,000 per year for the new equipment and tooling needed. The cost of raw materials and variable overhead would be about \$1,100 per unit, and labor costs would be \$300 per unit produced.

- a) Should Taksin make rather than buy?
- b) What is the break-even quantity?
- c) What other considerations might be important?

(15 points)

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8. A numerical model of the behavior of a firm's cost is shown in the following table.

a. Complete the following table.

| Quantity | Total revenue | Total Fixed cost | Total variable cost | Total cost | Average Cost | Marginal cost |
|----------|---------------|------------------|---------------------|------------|--------------|---------------|
| 0 | 0 | 100 | 0.00 | 100.00 | | |
| 1 | 110 | 100 | 55.70 | 155.70 | 155.7 | 55.70 |
| 2 | 220 | 100 | 105.60 | | | |
| 3 | | 100 | 153.90 | | | |
| 4 | | 100 | 204.80 | | | |
| 5 | | 100 | 262.50 | | | |
| 6 | | 100 | 331.20 | | | |
| 7 | | 100 | 415.10 | | | |
| 8 | | 100 | 518.40 | | | |
| 9 | | 100 | 645.30 | | | |
| 10 | | 100 | 800.00 | | | |
| 11 | | 100 | 986.70 | | | |
| 12 | 1320 | 100 | 1209.60 | 1309.60 | | |

b. What would you advise this firm to do?

(10 points)