**PRINCE OF SONGKLA UNIVERSITY**

**FACULTY OF ENGNEERING**

**Mid Term Examination : Semester 1** **Academic Year : 2007**

**Date : August 2 , 2007.** **Time : 09.00-12.00**

**Subject : 225-351 Production Planning and Control** **Room : หัวหุ่น**

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**ทุจริตในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา**

Instruction :

1. There are 5 questions , 100 points.
2. Attempt all questions.
3. A sheet of paper note at size A 4 , a dictionary and a calculator are allowed.
4. Borrowing things from other students is prohibited.

| Problem no. | Full Score | Score |
|---|---|---|
| 1 | 20 | |
| 2 | 20 | |
| 3 | 20 | |
| 4 | 20 | |
| 5 | 20 | |
| Total | 100 | |

Assoc. Prof. Dr. Sunchai Klinpikul

Instructor

1. A quarterly data for the past two years is given.

| Period | Actual demand | Period | Actual demand |
|---|---|---|---|
| 1 | 300 | 5 | 416 |
| 2 | 540 | 6 | 760 |
| 3 | 885 | 7 | 1191 |
| 4 | 580 | 8 | 760 |

Prepare a forecast for the upcoming year using decomposition method. Smooth the data using a single moving average, N=3. (20 points)

2. It is your responsibility , as the new head of the automation section of Nichols Department Store , to ensure that the reorder quantities for the various items have been correctly established. You decide to test one item and choose Michelin tires, XW size 85x14 BSW. A perpetual inventory system has been used, so you examine this as well as other records and come up with the following data :

| | |
|---|---|
| Cost per tire | $ 35 each |
| Demand | 1,200 tires per year |
| Order Cost | $ 20 per oder |
| Delivery lead time | 4 days (Maximum = 7 days) |

Material handling and management cost in the warehouse for Michilin tires is estimated at $ 300 per month and the interest rate is 5% per year. Insurance cost is allocated at $ 250 per year. Because customers generally do not wait for tires but go elsewhere. You decide on a service without any shortage. Assume the demand occur 365 days per year. Maximum demand occurred was double of the average demand.

(a) Determine an economic order quantity. (15 points)

(b) Determine the reorder point . (5 points)

3. Product X is made of two units of Y and three of Z. Y is made of one unit of A and two units of B. Z is made of two units of A and four units of C. Lead time for X is one week, Y is two weeks, Z is three weeks, A is two weeks, B is one week and C is three weeks.

a. Draw the Bill of Materials (BOM) of product X. (10 points)

b. If 100 units of X are needed in week 10, develop an MRP Schedule showing when each item should be ordered and in what quantity. (10 points)

4. A company produces RBD vegetable oil with a following sales and cost structure :

| | Baht per litre |
|---|---|
| Selling price | 38 |
| Raw materials and variable costs | 20 |
| Labor cost | 7 |
| Overhead cost | 5 |
| Administration cost | 2 |
| Profit | 4 |

Since market demand exceeded production capacity, then the company operated 24 hours per day with continuous process at 480,000 litres per day.

One day, there was a leakage of steam in the vacuum system for two hours before the repair could be made and the RBD oil produced during leakage had to be thrown away.

(a) How much loss of this company due to this accident ? (10 points)

(b) Suppose the demand had decreased to 33,000 litres per day, how much loss of the company due to this accident ? (10 points)

5. A manufacturing firm has discontinued production of a certain unprofitable product line. Considerable excess production capacity was created as a result. Management is considering devoting this excess capacity to one or more of three products, $x_1$, $x_2$ and $x_3$.

Machine hours required per unit are :

| | **Product** | | |
|---|---|---|---|
| **Machine type** | $x_1$ | $x_2$ | $x_3$ |
| Milling M/C | 8 | 2 | 3 |
| Lathe | 4 | 3 | 0 |
| Grinder | 2 | 0 | 1 |

The available time in machine hours per week is :

| | Machine hours per week |
|---|---|
| Milling M/C | 800 |
| Lathe | 480 |
| Grinders | 320 |

The sales people estimate they can sell all units of $x_1$ and $x_2$ that can be made. But the sales potential of $x_3$ is 80 units per week maximum.

Unit profit for three products are :

| | **Unit profit** |
|---|---|
| $x_1$ | $ 20.00 |
| $x_2$ | $ 6.00 |
| $x_3$ | $ 8.00 |

Formulate a Linear Programming model of this problem. (20 points)