

**Faculty of Engineering
Prince of Songkla University**

Final Examination : Semester I

Academic Year : 2005

Date : October 6, 2005.

Time : 13.30-16.30

Subject : 225-351 Production Planning and Control

Room : หัวหุ่น

**ทฤษฎีในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น
และพักการเรียน 1 ภาคการศึกษา**

Part A

Instructions :

1. There are 3 questions, 60 points.
2. Attempt all questions.
3. A sheet of paper note at size A4, a dictionary, and a calculator are allowed.
4. Borrowing things from other students is prohibited.

Problem no.	Full score	score
1	15	
2	15	
3	30	
Total	60	

Assoc.Prof.Dr. Sunchai Klinpikul

Instructor



1. A manufacturer produces three models of a certain product. The company uses two types of raw material (A and B) of which 2,000 and 3,000 units are available. The raw material requirements per unit of the three models are given below :

Raw Material	Requirement per unit of given model		
	Model 1	Model 2	Model 3
A	2	3	5
B	4	2	7

The labor time for each unit of model 1 is twice that of model 2 and three times that of models 3. The entire labor force of the factory can produce the equivalent of 700 units of model 1. A market survey indicates that the minimum demand of the three models are 200, 300, and 150 units, respectively. However, the ratios of the number of units produced must be equal to 3:2:5 .

Assume that the profit per unit of model 1, 2, and 3 are 30, 20, and 50 dollars. Formulate the problem as a Linear programming model to maximize profit.

(15 points)

2. Mr. Aoki is planning to rent a house which he plans to convert to a retail store. The rental fee and other fixed costs amount to \$ 2,400 per month, and these costs are constant regardless of the store size.

Several alternatives exist for hiring part-time employees. However, only two to five employees will be considered because of limitations of other facilities. A survey shows that monthly gross margin is as in the table below.

<u>Alternative</u>	<u>No. of Employees</u>	<u>Gross Margin</u>
A	2	6,000
B	3	8,400
C	4	9,600
D	5	10,000

The labor cost for 1 employe is \$ 800 per month. Which alternative is the most profitable ?

(15 points)

3. A vegetable oil refinery is producing RBD olein, shortening, margarine, and fatty acid distilled as a by-product. The daily production on September 20, 2005 was :

Item	RBD olein	Shortening	Margarine	Fatty Acid
Cartons	150	50	32	170 kgs.
Bottle (Extra)	15	12	1	-
Packing wt. (Kg./bot.)	0.950	0.540	0.500	-
Selling Price (Baht/bottle)	32.00	23.00	25.00	12.00 B/Kg.

Note : 1 carton = 24 bottles

Raw material (crude vegetable oil) bought from 5 suppliers at different prices and quantities was :

	Supplier no.				
	1	2	3	4	5
Quantity (kgs.)	750	1200	800	600	250
Price (Baht/kg.)	15.00	14.00	16.00	18.00	20.00

Production materials, indirect materials, and overhead costs were :

Item	Chemicals (kg.)	Bleaching Earth (kg.)	Fuel oil (litres)	Electricity (kwh.)	Average overhead cost (Baht/day)
Quantity (units)	30	150	250	1,540	2,500
Cost (Baht/unit)	18.00	15.00	8.50	2.70	-

Packing materials consist of :

Item	Olein bottle	Shortening bottle	Magazine bottle	Label (at bottle)	Master Carton
Price (Baht/unit)	5.50	5.00	8.00	0.50	18.00

Note : Fatty acid was sold in bulk, no packaging material and transportation cost required.

Transportation cost on average was 7.00 Baht per carton for olein, shortening, and margarine.

Labor cost was 2,250 Baht per day and the fixed cost was 5,000 Baht per day.

(a) Draw an information flow diagram of the daily production for the refinery. The output information is profit/loss and product yields. (15 points)

(b) Calculate daily cost and profit and product yields of the operation on September 20, 2005. (15 points)

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Final Examination : Semester 1

Academic year 2005 (2548)

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Room หัวทูน

ทฤษฎีในการสอบ โทษขั้นต่ำปรับตกในรายวิชาที่ทฤษฎีนั้น และพักรการเรียน 1 ภาคการศึกษา โทษสูงสุดให้ออก

Part B

1. There are 3 topics in total examination : 11 pages , and 40 scores
2. Do your examination in these papers and return all of them
3. Write down your name , surname , student code in each paper
4. Show all calculation , and assumption

	Scores	Your Scores
1	13	
2	13	
3	14	
Total	40	

No.....

(From the number in examination fist)

Name.....

Surname.....

Student code.....

Year / department.....

Assistant Professor Yodduang Pannara

Name.....Surname.....Student Code.....

1. From the topic of project management with CPM.

1.1 CPM network in figure 1.1a , 1.1b and 1.1c correct or not.

- If it is correct, you must write down that it is correct.
- If it is not correct or unsuitable, you must correct or adjust it.
- If you don't write anything, your score is zero.

1.1a

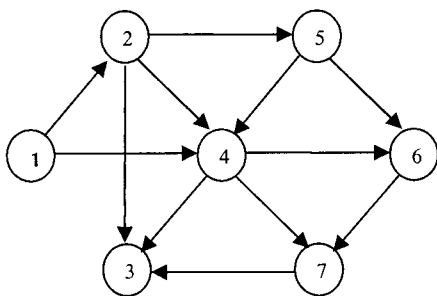


Figure 1.1a

(2 scores)

1.1b

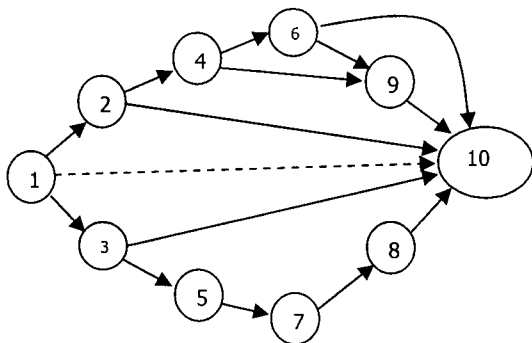


Figure 1.1b

(2 scores)

1.1c

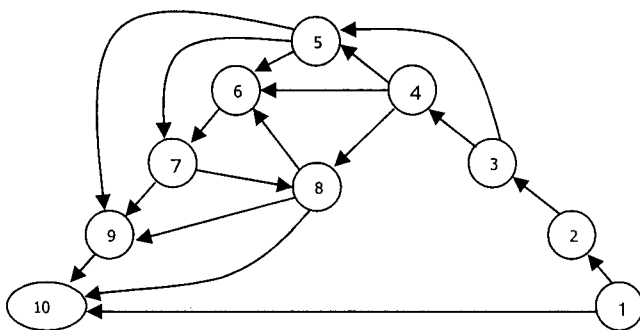


Figure 1.1c

(2 scores)

Name.....Surname.....Student Code.....

1.2. From the topic of project management with CPM, write down the arrow diagram from the data below.

- | | | |
|------------------------------------|--|--------------|
| Activity A | starts the project. | |
| Activity A | starts before activity B, C and D. | |
| Activity B | starts before activity E , F , G , H . | |
| Activity D | starts before active M , N , P . | |
| Activity C , E , F , G , H , M , N | start before activity I. | |
| Activity F,H | start before activity K . | |
| Activity K | starts before activity L . | |
| Activity I , L and P | start before activity Q . | |
| Activity Q | is the final activity | (7 scores) |

(Total 13 scores)

Name.....Surname.....Student Code.....

2. From the topic of project management with CPM

2.1 From CPM Network in figure 2.1 , the number in each path or activity is time (days)

For example, the working days form model ① to node ② is 2 days

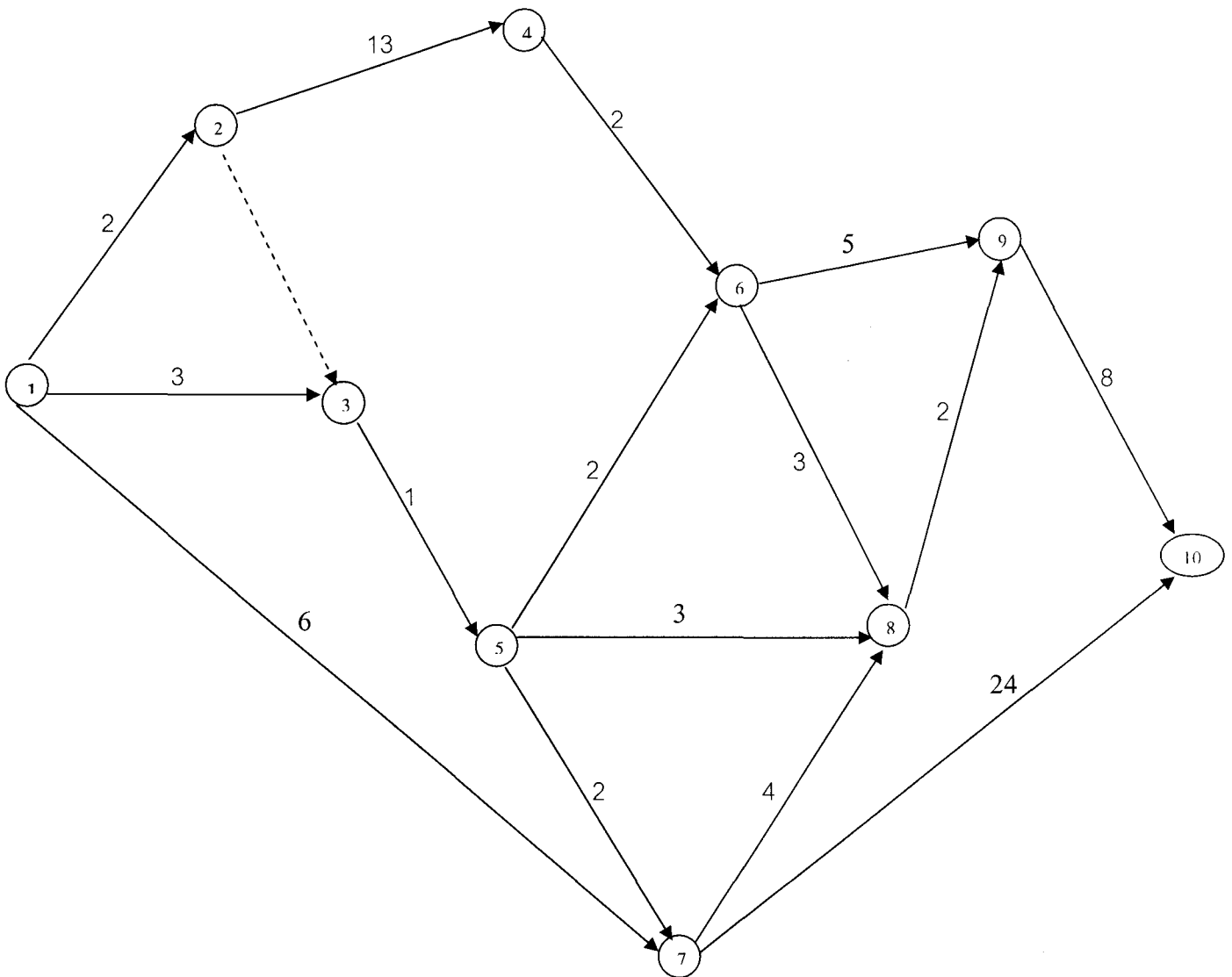


Figure 2.1

Name.....Surname.....Student Code.....

2.1.1 What is the meaning and benefit of critical path ? (1 scores)

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.....

2.1.2 Show all calculation in figure 2.1 For

a. Which paths are the critical paths ? Show all of them (2 scores)

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b. What is the value of the critical path ? (1 score)

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2.1.3 For every activity , calculate

- Earliest Start (ES)
 - Latest Start (LS)
 - Earliest Finish (EF)
 - Latest Finish (LF)
 - Total Float (TF)
- (3 scores)

2.1.4 For every node , calculate

- Earliest Event Occurrent Time (EO)
 - Latest Event Occurrent Time (LO)
- (2 scores)

(Remarks : You must show the data from 2.1.3 and 2.1.4 in Figure 2.1)

Name.....Surname.....Student Code.....

2.2 Figure 2.2 is the cost diagram of one activity in PERT project. Figure 2.2 is not to scale .

2.2.1 Describe the meaning of figure 2.2 with all calculation.

2.2.2 Explain the meaning of the data that you get from 2.2.1

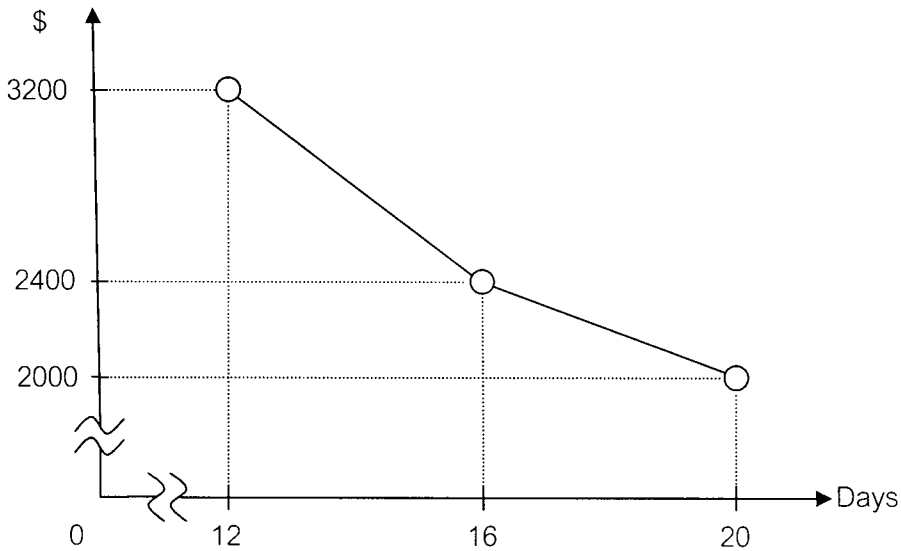


Figure 2.2 (not to scale)

(4 scores)

(Total 13 scores)

3.3. Rearrange the method of working to minimize weight mean flow time (F_w) with priority. How many days should the project be ? How many average value of inventory in the system (\bar{V}) should it be ? (You can use graph or calculation method. It depends on your decision)

(6 scores)

Remarks : Draw the graph in this paper and specify the scale of each position.

(Total 14 scores)

Name.....Surname.....Student Code.....

3. The factory owns one system machine. The factory receives the orders below.

JOB	A	B	C	D	E	F	G
Working time (Days)	20	30	24	15	33	18	9
Weight	2	1	3	1	3	1	1
Priority	1	2	2	1	1	3	2
Priority 1 is Minimum , Priority 3 is Maximum							

3.1. How many methods do they have to rearrange the ways of working ? You must concern with working time, weight and priority in this problem. (Show all calculation) (2 scores)

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3.2. Rearrange the method of working to maximize weight mean flow time (\bar{F}_w) by using graph method. In this problem, the machine works for 40 days and breaks down 15 days. After that the technician can fix it and it works very good until the project is finished. How many days should the project be ? How many average value of inventory in the system (\bar{V}) should it be ? Use graph method for this problem. (This problem does not concern with priority)

(6 scores)

3.3. Rearrange the method of working to minimize weight mean flow time (\bar{F}_w) with priority. How many days should the project be ? How many average value of inventory in the system (\bar{V}) should it be ? (You can use graph or calculation method. It depends on your decision)

(6 scores)

Remarks : Draw the graph in this paper and specify the scale of each position.

(Total 14 scores)