PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester 1

Date: October 9, 2006

Subject: 225-352 Operations Research

Academic Year: 2006

Time: 9.00-12.00

Room: หัวหุ่น

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้นและ
พักการเรียน 1 ภาคการศึกษา
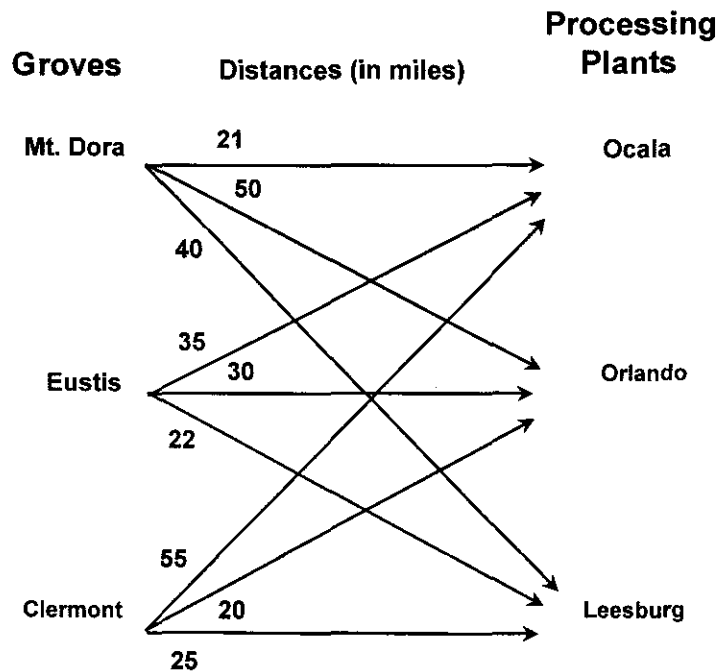
Part A

Instructions:

1. There are 4 questions, 60 points.

2. Books and notes are allowed.

3. A calculator and a dictionary are allowed.

4. Borrowing things from other students is prohibited.

Question No.	Full Score	Score
1	10	
2	10	
3	20	
4	20	
Total	**60**	

Dr. Runchana Sinthavalai

Instructor

1. Company AAA is a grower of oranges with locations in the cities of Mt. Dora, Eustis and Clermont. AAA currently has the grove capacities to provide 275,000 kilograms of orange from Mt. Dora; 400,000 kilograms from Eustis; and 300,000 kilograms from Clermont. These capacities are represented as the amount of oranges per month. The processing plants are located in Ocala (capacity of 200,000 kilograms/ month), Orlando (600,000 kilograms/ month) and Leesburg (225,000 kilograms/ month). AAA contracts with a trucking company to transport its oranges, which charges a flat rate for every mile that each kilograms of fruit must be transported.   The distances (in miles) between the groves and processing plants are as follows:

Groves	Distances (in miles)	Processing Plants

Mt. Dora	21	Ocala
	50	
	40	
	35	
Eustis	30	Orlando
	22	
	55	
Clermont	20	Leesburg
	25	

The objective is to minimize the transportation cost.   *Formulate a problem for linear programming: (a) Objective function and (b) Constraints* to optimize the amount of oranges transported from each grove to a plant.

2. Consider the LP problem:

Maximize Z= $3x_1 + \dfrac{9}{2}x_2$
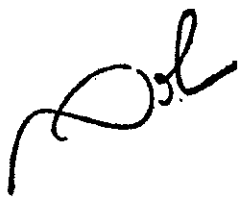
S.T. $\dfrac{2}{5}x_1 + \dfrac{1}{2}x_2$ $\leq$ 300
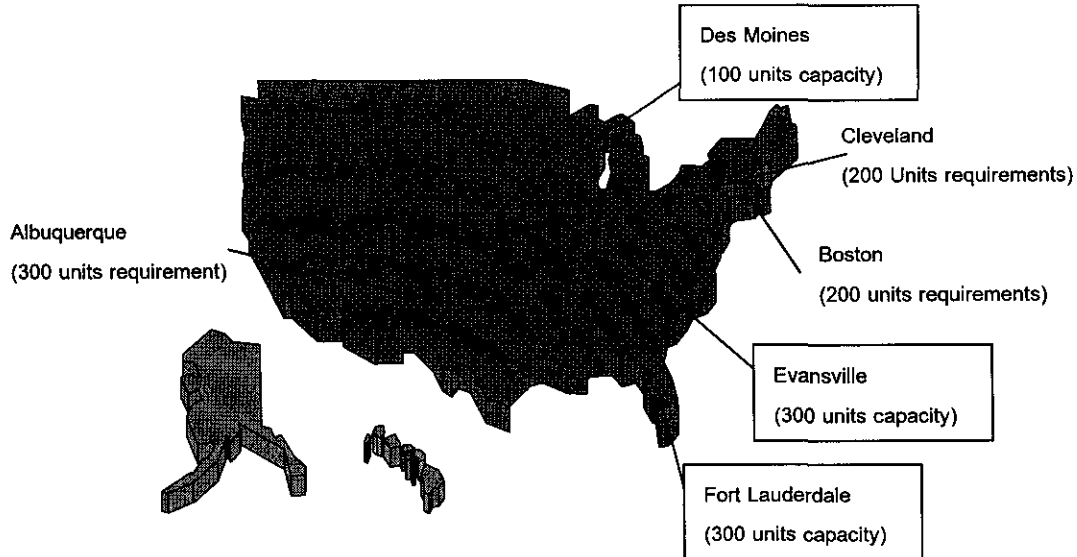
$X_1 + 2X_2$ $\leq$ 900

X_2 $\leq$ 375

X_1 $\leq$ 600

$X_1 \geq 0,\ X_2 \geq 0$

Formulate the simplex method for the optimal solution.

3. Company XXX has 3 factories and 3 warehouses. The factory capacities and the requirements of the warehouses are presented in the picture.

Des Moines
(100 units capacity)

Cleveland
(200 Units requirements)

Albuquerque
(300 units requirement)

Boston
(200 units requirements)

Evansville
(300 units capacity)

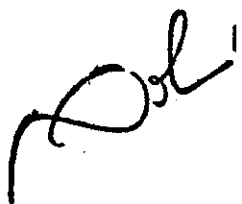Fort Lauderdale
(300 units capacity)

The following table presents the costs of shipping a product from one to another place. The objective is to minimize the cost of transportation. <u>Using Vogel and Modi methods to find the optimal solution.</u>

From (Sources)	To (Destination)		
	Albuquerque	Boston	Cleveland
Des Moines	$5	$4	$3
Evansville	$8	$4	$3
Fort Lauderdale	$9	$7	$5

4. Players I and II simultaneously call out one of the numbers one or two. Player I wins if the sum of the numbers is odd. Player II wins if the sum of the numbers is even. The amount paid to the winner by the loser is the sum of the numbers in Baht. Find the optimum value of the game and the probabilities that Player I and II call number one and two, which produce the optimum solution.

Faculty of Engineering

Prince of Songkla University

Final Examination : Semester

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Room : ห้องหัวหุ่น

ทุจริตในการสอบโทษขั้นต่ำปรับตกในที่ทุจริตนั้น และพักการเรียน 1 ภาคการศึกษา

Part B :

1. Total 2 topics, 11 pages and 40 scores.

2. Do you examination in these papers and return all of them.

3. Write down your name, last name and student code in every page.

4. All books, notes, and calculators are allowed, but you are not permitted to borrow anything from the others.

	Scores	Your Scores
1	20	
2	20	
Total	40	

Number...

(From the number in examination)

Name..

Last name ....

Student code ....

Year / Department ....

Assistant Professor Yodduang Pannara

Name……………………………… Last name…………………………………… Student Code…………………

1. The management collects the data of the machine in order to replace it. The project is 5 years. The machine can not use more than 7 years.

    1.1 The price of new machine (Buy at 1st of January for each year) :

        - The cost of buying machine in 1st year is 40,000 Baht.

        - The cost of buying machine in 2nd year is 46,000 Baht.

        - The cost of buying machine in 3rd year is 52,000 Baht.

        - The cost of buying machine in 4th year is 58,000 Baht.

        - The cost of buying machine in 5th year is 63,000 Baht.

    1.2 The maintenance cost follows :

        - 14,000 Baht for first year.

        - 17,000 Baht for second year.

        - 21,000 Baht for third year.

        - 24,000 Baht for fourth year.

        - 32,000 Baht for fifth year.

    1.3 Selling price of old machine (Sell at the end of year) :

        - The salvage value for using machine for 1 year is 30,000 Baht.

        - The salvage value for using machine for 2 years is 26,000 Baht.

        - The salvage value for using machine for 3 years is 21,000 Baht.

        - The salvage value for using machine for 4 years is 17,000 Baht.

        - The salvage value for using machine for 5 years is 14,000 Baht.

Use dynamic programming to find the best reliability policy and what is the value ?

Remark : All values are present worth.

(20 scores)

Name.. Last name.. Student Code....................

2. From telephone network in figure 2.1, the data between each node is reliability.

For example

- Reliability from node ① to node ② is 0.95

- Reliability from node ③ to node ④ is 0.87

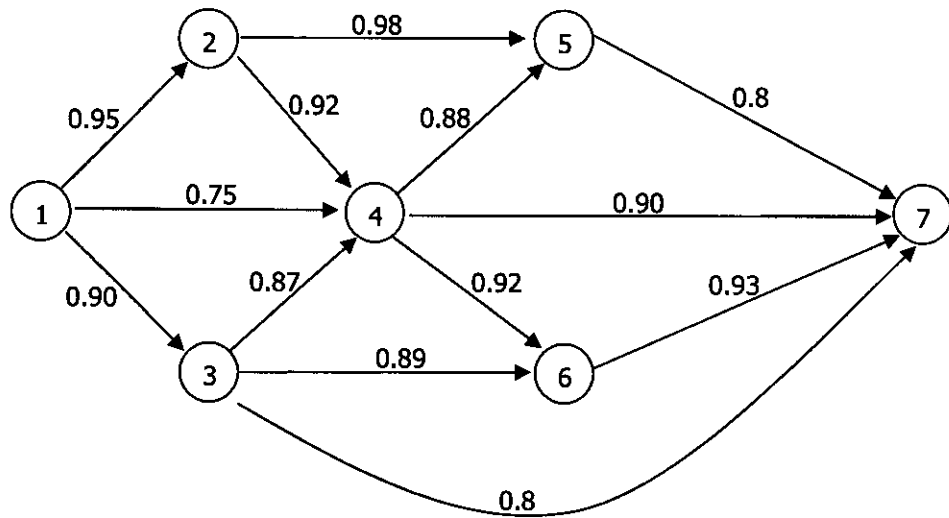- Reliability between node ① and node ⑤ (① - ④ - ⑤) is (0.75) (0.88) = 0.66

Figure 2.1

Use dynamic programming to find the best reliability from node ① to ⑦. What is the value and path ?

(20 scores)