PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester 1

Date: October 8, 2007.

Subject: 225-352 Operations Research

Academic Year: 2007

Time: 09:00 - 12:00

Room: หัวรุ่น

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้นและ
พักการเรียน 1 ภาคการศึกษา

Part A

Instructions:

1. There are 3 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	15	
2	15	
3	30	
Total	60	

Dr. Runchana Sinthavalai

Instructor

1. *(15 Points)* The game of paper-scissors-rock. In this game, Players I and II simultaneously display one of the three objects: paper, scissors, or rock. If they both choose the same object to display, player II loses 2 Baht. If they choose different objects, then scissors win over paper (scissors cut paper). The loser pays 3 Baht. Rock wins over scissors (rock breaks scissors), then the loser pay 1 Baht. Paper wins over rock (paper cover rock), then the loser pays 4 Baht.

    1.1 Develop the table for the payoff function, Player I.

    1.2 Can the matrix be eliminated by dominance or recessive?

    1.3 Is there a saddle point?

2. *(15 Points)* An appliance manufacturer produces two models of microwave ovens: A and B. Both models require fabrication and assembly work; each A uses four hours of fabrication and two hours of assembly, and each B uses two hours of fabrication and six hours of assembly. There are 36,000 fabrication minutes available this week and 28,800 minutes of assembly. Each A contributes $40 to profits and each B contributes $30 to profits. What quantities of A and B will maximize profits? <u>Use Simplex Method to solve the problem.</u>

3. A toy manufacturer wants to open a third warehouse that will supply three retail outlets. The new warehouse will supply 500 units of demand per week. Two locations are being studied, N1 and N2. Transportation costs for location N1 to stores A, B, and C are $6, $8 and $7 per unit, respectively. For location N2, the costs are $10, $6 and $4, respectively. The existing system is shown in the following table. <u>Which location would result in the lower transportation costs for the system?</u>

To From	Store A	Store B	Store C	Capacity (units/ week)
Warehouse 1	$8	$3	$7	500
Warehouse 2	$5	$10	$9	400
Demand (units/ week)	400	600	350	

Using VAM and Modi Method to solve the problem.

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ทุจริตในการสอบโทษขั้นต่ำปรับตกในที่ทุจริตนั้น และพักการเรียน 1 ภาคการศึกษา

Part B :

1. Total examination has 2 topics, 10 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.

5. Show all calculation and assumption. They are very important.

	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

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Time (Minutes)
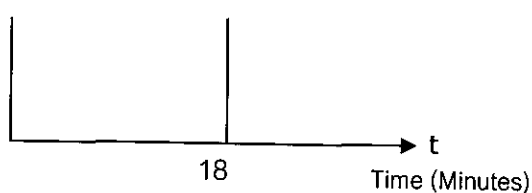
Figure 1.1

(20 scores)

Name……………….………Surname…………………………Student code………………….....

1. The factory with many machines needs the maintenance team. Machines break down time
    is Poisson distribution with mean 2.4 machines per hour. The factory will lose the money for
    repairing each machine 250 baht per hour. There are three maintenance teams: A, B and C.

    Team A : The cost is 500 Baht/hour and you pay when you use team A. The service time
              is Exponential distribution with mean 20 minutes per machine.

    Team B : The cost is 400 Baht/hour and you pay when you use team B. The service time
              is Constant distribution with mean 2.3 machines per hour.

    Team C : The salary is 5,000 Baht/day. The service time distribution is in figure 1.1.

        Each month has 26 working days and 9 hours per working day. Show all
    calculations or explanations.

    1.1. Calculate ρ , L, Lq, W, Wq, B, I and P_0 for each team.
    1.2. Which team do you select to make maximum benefit for the factory ? What is the total
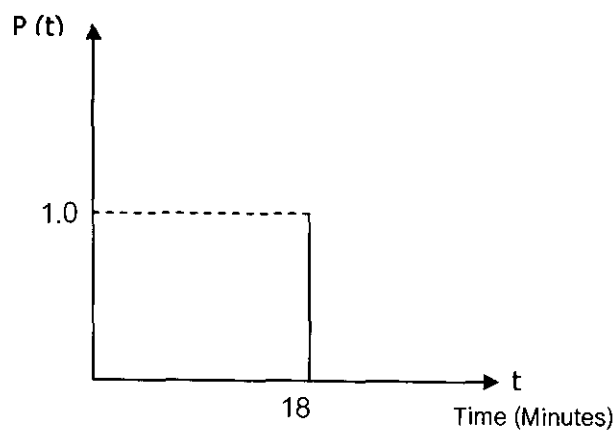   cost for each team per *month* ?

Figure 1.1

(20 scores)

Name..................................Surname..............................Student code...........................

2. *Use only Dynamic programming* to solve the problem below.

Consider Thai Investment Company which is planning its capital improvement projects for the upcoming year. The company has the budget for 40,000,000 Baht and is reviewing 4 possible projects (A, B, C and D) for funding. Listed below are the projects, together with their costs and net present values of returns.

Project	Cost (Millions Baht)	Return (Million Baht)
A	12	1.7
B	17	2.3
C	9	1.2
D	7	1

Thai Investment Company will not partially fund a project, thus a project will be funded entirely or not at all. Thai Investment Company's objective is to maximize the return of all the projects.

What is your decision? (The method to solve this problem is very important. You must show it.)

(20 scores)