Name ..... ID Code.....

Faculty of Engineering

Prince of Songkhla University

Final Examination : Semester I **Academic Year : 2004**

Date : October 5, 2004 **Time :** 13.30-16.30

Subject : 225-354 Operations Research **Room :** A 401

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น
และพักการเรียน 1 ภาคการศึกษา โทษสูงสุดให้ออก

PART A

Instructions :

1. There are 3 questions, 40 points.
2. Books and notes are allowed.
3. Borrowing things from other students is prohibited.
4. A calculator and dictionary are allowed.

Problem no.	Full score	Score
1	10	
2	15	
3	15	
Total	**40**	

Asso. Prof. Dr. Sunchai Klinpikul
Instructor

Name ..... ID Code.....

1. **A market gardener grows 4 kinds of crops, carrots, cabbages, onions and potatoes.**

   The cost and profit of each type are :

Crop	Cost of fertilizer ฿/acre	Cost of pesticides ฿/acre	Profit ฿/acre
Carrots	4	2	50
Cabbages	2	9	40
Onions	5	2	10
Potatoes	0	3	20

The gardener has budget 400 Baht of fertilizer and 500 Baht of pesticide.

What will be the number of acres of each crop he should plant in order to maximize his profit ? **(10 points)**

2. An airlines company is considering the purchase of new long-range, medium – range, and short – range jet passenger air-planes. The purchase price would be $ 6,700,000 for each long – range plane, $ 5,000,000 for each medium – range plane, and $ 3,500,000 for each short – range plane.

The Board of Directors has authorized a maximum commitment of $150,000,000 for these purchases. Regardless of which airplanes are purchased, air travel of all distances is expected to be sufficiently large that these planes would be utilized at essentially maximum capacity. It is estimated that the net annual profit would be $ 420,000 per long – range plane, $ 300,000 per medium – range plane, and $ 230,000 per short – range plane.

It is predicted that enough trained pilots will be available to the company for only 30 new airplanes. If only short – range planes were purchased, the maintenance facilities would be able to handle 40 new planes. However, each medium – range plane is equivalent to 1.33 short – range planes, and each long – range plane is equivalent to 1.67 short-range planes in terms of their use to the maintenance facilities.

Management wishes to know how many planes of each type should be purchased in order to maximize profit. Formulate the linear programming model for this problem.

(15 points)

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3. Consider a competitive game with the following pay-off table.

		B	
		1	2
A	1	2	4
	2	2	3
	3	3	2
	4	-2	6

Find the optimal solution of this game. (15 points)

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Final Examination : Semester 1 Academic year 2004 (2547)

Date : October 5, 2004 (2547) Time 13:30 – 16:30

Subject : 225 – 354 Operations Research I (PART B) Room A401

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และพักการเรียน ภาคการศึกษา โทษสูงสุดให้ออก

PART B

1. Total examination has 3 topics , 11 pages , and 60 scores .
2. Do your examination in these papers and return all of them .
3. Write down your name , surname , student code in all the papers .
4. Show all methods of calculation , and assumption .
5. All books , notes and calculators are allowed but you are not permitted to borrow anything from others .

	Scores	Your Scores
1	20	
2	20	
3	20	
Total	60	

Name.....

Surname.....

Student code.....

Year/ Department .....

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

1. The transportation company works 10 hours per day and 26 days per month . Each working day , there are trucks go to the company with mean 30 trucks per hour . The distribution is exponential. The transportation company has 4 models to select for service .

The 1st model , there are 2 workers working like one team and the 1st model can serve the merchandise with mean 25 trucks per hour

The 2nd model , there are 3 workers working like one team and the 2nd model can serve the merchandise with mean 37 trucks per hour

The 3rd model , there are 4 workers working like one team and the 3rd model can serve the merchandise with mean 48 trucks per hour

The 4th model , there are 5 workers working like one team and the 4th model can serve the merchandise with mean 52 trucks per hour

The service time distribution of the 1st, 2nd and 3rd model is poisson . The service time distribution of the 4th model is constant

The salary of each worker is 20 baht per hour . The waiting time cost for each truck is 350 baht per hour .

You are the management of this company . Calculate the total cost for every model . What model do you select to make the best benefit ?

(20 scores)

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

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

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

2. The World Health Organization (WHO) is devoted to improve health care in the underdeveloped countries (A , B and C) . WHO has five medical teams available to allocate among three countries to improve health care , WHO needs to determine how many teams to allocate to each of these countries to maximize the total effectiveness of the five teams . The measure of effectiveness being used is additional man – years of life .

Table 2.1 gives the estimated additional man – years of life (in multiples of 1,000) for each country for each possible allocation of medical teams .

No. of medical teams	Thousands of additional man – years of life Country		
	A	B	C
0	0	0	0
1	30	30	40
2	65	50	65
3	85	80	90
4	100	110	105
5	140	135	120

Table 2.1 : Data for World Health organization (WHO)

Using dynamic programming to find the best strategy . Explain it clearly

(20 scores)

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

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

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

3. Chuvit uses a car to send donuts deliveries. **Once a year , Chuvit decides whether or not to replace the present car with a new car** . His decision is based on the car ' s operating cost , resale value and the purchase price of a new car .

Chuvit always purchases the same type of car . A new car cost 1,000,000 baht . According to the history records , the maximum life time of the car is only 4 years . These history records also indicate that the car ' s operating cost will be 250,000 baht in the first year , 330,000 baht in the second year , 460,000 baht in the third year and 580,000 baht in the forth year . Chuvit find that the resale value for used car given in table 3.1 .

When Chuvit starts the project , Chuvit ' s car is one year old . When Chuvit finishes the project , he sales the used car. **The total life time of this project is 3 years** . Chuvit is eager to determine the replacement policy that will minimize total costs . (He wants to know the best times to replace the car over the next three years .)

Car age (Years)	Resale value (Baht)
1	700,000
2	520,000
3	460,000
4	230,000

Table 3.1 : Resale value for used car

Using dynamic programming to find the best strategy . Explain it clearly

(20 scores)

(Assistant Professor Yodduang Pannara)

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

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

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