

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester I

Academic Year: 2004

Date: 5 August 2004

Time: 09.00-12.00 hr.

Subject: 220-574 Mathematical and Statistical

Techniques for Transportation Studies

Room: A200

คำสั่ง 1. ตอบทุกคำถามในกระดาษข้อสอบ

2. ข้อสอบมีทั้งหมด 4 ข้อใหญ่ มีคะแนนเท่ากันทุกข้อ

1. Siam Oil Co. is building a refinery to produce three products: diesel, gasoline, and lubricants. The demands (in bbl/day) for these products are 14,000, 20,000, and 20,000, respectively. Iran and Dubai are under contract to ship crude to Siam Oil Co. Because of the production quotas specified by OPEC (Organization of Petroleum Exporting Countries) the new refinery can receive at least 30% of its crude from Iran and the remaining amount from Dubai. Siam Oil Co. predicts that these demand and crude oil quotas will remain steady over the next 10 years.

The different specifications of the two crude oils lead to different product mixes: One barrel of Iran crude yield .2 barrel of diesel, .3 barrel of gasoline, and .15 barrel of lubricant. The corresponding yields from Dubai crude are .1, .6 and .2, respectively.

Siam Oil Co. needs to determine the minimum capacity of the refinery (in barrels per day.).

2. Cars are shipped from three distribution centers to four dealers. The shipping cost is based on the mileage between the sources and the destinations and is independent of whether the truck makes the trip with partial or full loads. Table below summarizes the mileage between the distribution centers and the dealers together with the monthly supply and demand figures given in number of cars. A full truckload includes 18 cars. The transportation cost per truck mile is 1000 Baht.

		Dealer				Supply
		1	2	3	4	
1	Center	100	150	200	140	400
2	Center	50	70	60	65	200
3	Center	40	90	100	150	150
Demand		100	200	150	160	

Solve this transportation problem for optimal solution.

2. The following tableau represents a specific simplex iteration. All variables are nonnegative. The tableau is not optimal for either a maximization or a minimization problem. Thus, when a nonbasic variable enters the solution, it can either increase or decrease z or leave it unchanged, depending on the parameters of the nonbasic variable.

Basic	x	x	x	x	x	x	x	x	Solution
z	0	-5	0	4	-1	-10	0	0	620
x	0	3	0	-2	-3	-1	5	1	12
x	0	1	1	3	1	0	3	0	6
x	1	-1	0	0	6	-4	0	0	0

- (a) Categorize the variables as basic and nonbasic and provide the current values of all the variables
- (b) Suppose that the problem is of the maximization type; identify the nonbasic variables that have the potential to improve the value of z . If each such variable enters the basic solution, determine the associated leaving variable, if any, and the associated change in z . Do not use the Gauss-Jordan row operations.
- (c) Repeat Part(b) assuming that the problem is of the minimization type.
- (d) Which nonbasic variable(s) will not cause a change in the value of z when selected to enter the solution?

4. JoShop needs to assign 4 jobs to 4 works. The cost of performing a job is a function of the skills of the workers. Table below summarizes the cost of the assignments. Worker 1 cannot do job 2, and worker 3 can not do job 3. Determine the optimal assignment using the Hungarian method.

		Job			
		1	2	3	4
Worker	1	5000	-	5000	2000
	2	7000	4000	2000	3000
	3	9000	3000	-	5000
	4	7000	2000	6000	7000

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