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RECHERCHE OPERATIONNELLE & CALCUL ECONOMIQUE

3rd year SECO3 (By BAYE MENJO)

March 2010 Time 3 hrs.

Exercise 1: 5pts [0.75; 1.5; 2.75]

A coffee blending company mixes three different ingredients (A, B, C) in order to manufacture two types of products. The following nutritional restrictions must be respected.

Product I:

Not more than 30% of A

Not more than 50% or less than 20% of B

Not less of B than there is of A

Product II:

Not less than 50% of A

Not more than 30% of B

Amount of B must be less than or equal to A

The cost of A, B, and C is 30 MU, 40 MU, and 35 MU per kg, respectively, and the supply available for these ingredients is 2000, 1000, and 3000 kgs, respectively. Carefully define the decision variables in a table and formulate the relevant LP problem to minimize costs.

Exercise 2: 5pts [1.5; 3; 0.5]

An Agro-industry owns a 100 hectare farm and intends to plant at most three crops. The seeds for crops A, B and C cost 40 MU, 20 MU, and 30 MU per hectare, respectively. A maximum of 3200 MU can be spent on seeds. Crops A, B, and C require 1, 2, and 1 workdays per hectare, respectively, and there are a maximum of 160 workdays available. If the Agro-industry can make a profit of 100 MU per hectare on crop A, 300 MU per hectare on crop B, and 200 MU per hectare on crop C.

- Formulate the relevant PL model
- Solve the LP model and identify, how many hectares of each crop should be planted to maximize profit? What is the maximum profit?
- How much is effectively used on seeds.

Exercise 3: 5pts [1; 1; 2; 1]

A small leather manufacturing firm employs a person who is a highly skilled hides and skin cutter, and it wishes to use the person at least 6 hours per day for this

purpose. On the other hand, the polishing facilities can be used in any amounts up to 8 hours per day. The firm specializes in three kinds of hides and skin - P, Q, and R. Relevant cutting, polishing, and cost requirements are listed in the table below.

	P	Q	R
Cutting	2hr	1hr	1hr
Polishing	1hr	1hr	2hr
Unit cost of leather	30M U	30M U	10M U

- a) Formulate the relevant LP model
- b) Formulate its dual
- c) Solve the dual by the Simplex method
- d) Use the dual final tableau to obtain the optimal value of :
 - i. the primal objective function
 - ii. the primal decision and surplus variables

Exercise 4 (5pts) [4.75; 0.25]

R and W king wishes to purchase the following types of exotic dresses:

Dress type	A	B	C	D
Quantity	100	200	450	150

Three manufacturers are willing to supply dresses; the quantities given below are the maximum that they are able to supply of any given combination of orders for dresses:

Manufactures	X	Y	Z
Total quantity	150	450	250

Management of R and W king expects the profit per dress to vary with the manufacturer as given in MU in the table below.

Type manufactures	A	B	C	D
X	2	3	3	1
Y	2	3	5	1
Z	2	4	4	2

- a) Use the transportation technique to solve the problem of how purchases should be made by the management of R and W king with a view to maximizing profit. What is the maximum profit?
- b) What is particular about the optimal solution?