AGEC 641
Chapter 7 Group Effort

1. Chips Potato Chips makes three types of potato chips: Regular, Ruffles, and Bar-B-Que. At current prices, the net margin per unit on the three exclusive of labor cost is $1.20, $1.70, and $2.00, respectively. Plant capacity limits production to 10,000 units daily. The company has a labor contract which requires that at least 40 employees work 8 hrs/day every day. There are at most 75 employees available. A laborer costs $64 per day. Labor requirements are 0.05, 0.08, and 0.10 man-hour per unit for the three products, respectively.
   a) Formulate a LP problem which will determine the optimal production plan.
   b) Write the dual to the problem formulated in part a).
   c) Give an economic interpretation to 1) the dual variables; 2) the dual objective function; and 3) the dual constraints

2 Delicious Ice Cream Company (DICC) wishes to develop a formula for its Delightful Chocolate flavor. In doing so, DICC realizes that the prices of ingredients it uses in ice cream are variable, so it wishes to develop a least-cost formulation. DICC also knows its ice cream must exhibit certain characteristics on butterfat content, solids content, sweetness, flavor and test weight as follows

Item	Minimum	Maximum
Butterfat	20%	25%
Solids	20%	35%
Sweetness	2 units	3 units
test weight	5 lbs.	6 lbs.
Volume	1 gallon	1 gallon
Flavor	0.1 units	0.3 units

The ingredients and their contents are as follows:

Ingredients	cost/unit ($)	butterfat (%)	solids (%)	sweetness (units)	flavor (units)	test weight (lbs.)	volume (gallons)
butter	5.00	60	50	0.01	0	6	1
whey	0.05	2	2	0	0	3	1
dry whey	2.00	0.5	80	0	0	10	1
nonfat dry	3.00	0.5	80	0	0	10	1
whole milk	1.00	4	10	0.005	0	3.5	1
cream	2.00	40	12	0	0	4	1
sugar	1.50	0	80	20	0	15	1
skim milk	0.90	0	8	0	0	3.3	1

chocolate	1.20	0	1	0.20	6	0.1	1

Set up a model to minimize the cost while staying within the ingredient limit.

3. Steve's Deluxe Strawberry Pies, Inc. (known as SDS) buys fresh strawberries from three supply areas, transports the fruit to one of two pie factories, and ships pies to four demand areas. The supply areas and fruit availability are

Location	Annual Availability (tons)
California	50
Florida	25
Texas	45

SDS owns two processing plants. The larger plant is newer and exhibits lower processing costs. SDS prides itself that each pie contains 4 pounds of fresh strawberries. Plant locations, processing costs, and capacities are

Location	Processing Cost per Pie ($)	Annual Capacity (Pies)
Reno, Nevada	1.00	20,000
Atlanta	0.90	40,000

The four major markets supplied by SDS and expected sales requirements are

Location	Requirements (Pies)
New York	15,000
New Orleans	12,000
Los Angeles	20,000
Chicago	13,000

Transport costs per ton of fresh strawberries are

From	To: Reno	Atlanta
California	5	25
Florida	30	10
Texas	15	12

Transport costs per case of pies (1 case = 10 pies) are

From	To: New York	New Orleans	Los Angeles	Chicago
Reno	0.05	0.08	0.02	0.04
Atlanta	0.04	0.02	0.09	0.03

Formulate a LP model to determine the least cost movement of fruit and pies.

4. Darius of Darius' Delicious Dairy is developing a direct action directive on how to deal with incoming daily delivery of milk. Darius of Darius' Delicious Dairy wishes to figure the way that milk can be processed so as to make maximum profits. Darius has several process that can be used, the result of which is cream, skim milk, 2% milk, and whole milk. Each process uses whole milk energy packaging and holding capacity. The processes are resource usages and:

Yield of:	**Process 1**	**Process 2**	**Process 3**
Cream	.03	0.02	0.0
Skim Milk	.97	-	-
2% Milk	-	.98	-
Homog Milk	-	-	1.00
Use inputs of:	**Process 1**	**Process 2**	**Process 3**
Energy	4	3.9	3.5
Whole Milk	1 gal.	1 gal.	1 gal.

In addition, each of the products produced used the following amounts of packaging time and holding capacity.

	Time	**Holding Capacity**
Cream	5 seconds	2.5 cu. ft.
All Milks	10 seconds	2 cu. ft.

The sale price for cream is $3.00, skim milk $1.85, 2% milk $1.90, and homog milk $1.95.

The Firm has 12 hours of packaging time, 10,000 cu. ft. of holding capacity (although more can be rented at 0.10/unit). Energy costs 0.10/unit. Whole milk is available for $1.00/gallon up to 5,000 gallons and for a $1.25 for as much more as required.

Formulate a profit maximizing LP.

5. Set up your own version of one of the problem structures in Chapter 5

Do the following:

a) formulate a word version of the problem
b) setup and solve in GAMS
c) explain the answer