Santa Clara University

M2: Application Assignment

INSTRUCTIONS

Work with your group members to answer the following questions.

QUESTIONS

Question 1:

Valu-Com Electronics manufactures five different models of telecommunications interface cards for PCs and laptops. As summarized in the following table, each of these devices requires differing amounts of printed circuit board, resistors, memory chips, and assembly.

	Per Unit Requirements				
	HyperLink	FastLink	SpeedLink	MicroLink	EtherLink
Printed Circuit Board (square inches)	20	15	10	8	5
Resistors	28	24	18	12	16
Memory Chips	8	8	4	4	6
Assembly Labor (in hours)	0.75	0.6	0.5	0.65	1

The unit wholesale price and manufacturing cost for each model are as follows:

	Per Unit Requirements				
	HyperLink	FastLink	SpeedLink	MicroLink	EtherLink
Wholesale Price	$189	$149	$129	$169	$139
Manufacturing Cost	$136	$101	$96	$137	$101

In its next production period, Valu-Com has 80,000 square inches of PC board, 100,000 resistors, 30,000 memory chips, and 5,000 hours of assembly time available.

The company can sell all the product it can manufacture, but the marketing department wants to be sure the company produces at least 500 units of each product and at least twice as many FastLink cards as HyperLink cards while maximizing profit.

A. Formulate an LP model for this problem.
B. Solve the LP model using Gurobi.
C. What is the optimal solution?
    - Note: Please use Gurobi to find the optimal solution.
D. Could Valu-Com make more money if it schedules assembly workers to work overtime?

Question 2:

The Rent-A-Dent car rental company allows its customers to pick up a rental car at one location and return it to any of its locations. Currently, two locations (1 and 2) have 16 and 18 surplus cars, respectively, and four locations (3, 4, 5, and 6) each need 10 cars. The costs of getting the surplus cars from locations 1 and 2 to the other locations are summarized in the following table.

	Costs of Transporting Cars Between Locations			
	Location 3	**Location 4**	**Location 5**	**Location 6**
Location 1	$54	$17	$23	$30
Location 2	$24	$18	$19	$31

Because 34 surplus cars are available at locations 1 and 2, and 40 cars are needed at locations 3, 4, 5, and 6, some locations will not receive as many cars as they need. However, management wants to make sure that all the surplus cars are sent where they are needed, and that each location needing cars receives at least five.

A. Formulate an LP model for this problem.
B. Solve the LP model using Gurobi.
C. What is the optimal solution?
    - Note: Please use Gurobi to find the optimal solution.

Question 3:

Fred and Sally Merrit recently inherited a substantial amount of money from a deceased relative. They want to use part of this money to establish an account to pay for their daughter's college education. Their daughter, Lisa, will be starting college five years from now. The Merrits estimate that her first-year college expenses will amount to $12,000 and increase $2,000 per year during each of the remaining three years of her education. The following investments are available to the Merrits:

Investment	Available	Matures	Return at Maturity
A	Every year	1 year	6%

B	1, 3, 5, 7	2 years	14%
C	1, 4	3 years	18%
D	1	7 years	65%

The Merrits want to determine an investment plan that will provide the necessary funds to cover Lisa's anticipated college expenses with the smallest initial investment.

A. Formulate an LP model for this problem.
B. Solve the LP model using Gurobi.
C. What is the optimal solution?
    - Note: Please use Gurobi to find the optimal solution.