CS635 – Problem Set #2

Due Date: February 7, 2014. **11AM**.

Instructions for Handing In Homework

Formulate the following problems in GAMS and solve them. Submit this assignment electronically using the instructions on the course web page. You should hand in exactly 5 files with the following names:

`hw2-1.txt (or hw2-1.doc), hw2-2.gms, hw2-2.txt, hw2-3.gms, hw2-3.txt.`

Use an editor to extract the required lines of output to the correspondingly names "txt" files, namely the model and solution status, the optimal values for the variables and the optimal value of the objective function. Ensure you use self-explanatory variable and equation names.

1 NEOS Optimization Tree

The answers to all the questions in this section should be placed into hw2-1.txt or hw2-1.doc and should be no longer than 1 page total.

There is a subsection of the NEOS Guide that contains information about different types of optimization models, their formulations, algorithms and applications thereof.

1.1 Problem

Find the web page that contains the Optimization Tree. Using the table in Lecture 1 that outlines the model types that are available in GAMS, match each of these to a section in the Optimization Tree. Are any missing?

1.2 Problem

Are there other sites on the web that provide better information regarding optimization models, formats and algorithms. Provide the URL for these sites.

1.3 Problem

Provide one concrete criticism of the Software Guide (in a paragraph). What is the issue, and how would you suggest it should be improved?

2   Alloy Blending

The company Steelco has received an order for 500 tonnes of steel to be used in shipbuilding. The steel must have the following charactersitics:

Chemical Element	Minimum Grade	Maximum Grade
Carbon(C)	2	3
Copper(Cu)	0.4	0.6
Manganese(Mn)	1.2	1.65

The company has seven different raw materials in stock that may be used for the production of this steel. The following table lists the grades, available amounts and prices for all materials:

Raw Material	C%	Cu%	Mn%	Availability in t	Cost in $/t
Iron alloy 1	2.5		1.3	400	200
Iron alloy 2	3		0.8	300	250
Iron alloy 3		0.3		600	150
Copper 1		90		500	220
Copper 2		96	4	200	240
Aluminium 1		0.4	1.2	300	200
Aluminium 2		0.6		250	165

2.1 Problem

The objective is to determine the composition of the steel that minimizes the production cost.

3   Weasley's Wizard Wheezes

You are in charge of an advertising campaign for Fred and George Weasley, who have invented a new brand of love potion, and they have given you a budget of 1 million galleons. You can advertise on wizard TV or in magazines. One minute of TV costs 20,000 Galleons and reaches 1.8 million potential wizarding customers; a magazine page (in the Quibbler) costs 10,000 galleons and reaches 1 million. You must sign up for at least 10 minutes of TV time.

3.1 Problem
How should you spend your budget to maximize your audience? Formulate the problem in GAMS and solve it.

3.2 Problem
It takes creative talent to create effective advertising; in your organization it takes three wizard-weeks to create a magazine page, and one wizard-week to create a TV minute. You have only 100 wizard-weeks available. Add this contraint to the model and determine how you should spend your budget.

3.3 Problem
Radio advertising reaches a quarter million wizards per minute, costs 2,000 galleons/per minute and requires only 1 wizard-day of time. How does this medium affect your solutions?

3.4 Problem
How does the solution change if you have to sign up for at least two magazine pages? A maximum of 120 minutes of radio?

You should be able to use one GAMS file for this entire problem, containing several models. In some cases you may want to fix a subset of the variables to zero. When answering the questions, include the solution report for each model.