Week 4 Homework

1. Problem 1 (16 pts) This problem involves building a transportation model. Instead of having suppliers ship directly to customers, this problem has factories that ship to warehouses and warehouses that ship to stores. (Think Walmart distribution centers). There are different per unit costs associated with shipping between factories and warehouses and also between warehouses and stores. Your job is to minimize the total shipping costs subject to the following constraints
   1. The total supply of each product is the same as the total demand
   2. The total over all products that may be shipped along a route is constrained by CapacityFW (from Factories to Warehouses) and Capacity WS (from Warehouses to Stores)
   3. The total number of all products that may be stored in a Warehouse is limited by MaxStorage
   4. For each product and for each warehouse the total product shipped from Factories to that Warehouse is the same as the total product shipped from that Warehouse to stores.
   5. For each product, the Supply at the Factories and the Demand at the Stores is specified.

You’ll want to attack this problem in steps:

* Step1: You’ll need to write an R script that reads the spreadsheet and produces an appropriate .dat file. As an example, the transpWrite.R script in the weekly download folder reads the transpsheet.xlsx file and produces the transp4new.dat file. You’ll need to produce your own script that reads an excel spreadsheet and produces a data file for the Factory to Store problem. You can test your script by seeing if you can read transpStoreSheet.xlsx and produce transpStore.dat (extra spaces don’t matter, but you’ll otherwise need to match). Finally, use your script to read transpStoreBigSheet.xlsx and produce a data file (you can rename it later).
* Step 2: Now you need to build the model. A “skeleton” model file is provided in the download folder: transpStore-Skeleton.mod. You can also study the transp4.mod file from the example last week. You can test your model by running it with the transpStore.dat file. If you’ve done everything correctly you should see this output

// solution (optimal) with objective 54800

Transport Amounts FW:

pA:fA->wA 300

pA:fA->wB 0

pA:fA->wC 0

pA:fB->wA 0

pA:fB->wB 0

pA:fB->wC 200

pA:fC->wA 0

pA:fC->wB 400

pA:fC->wC 0

pA:fD->wA 0

pA:fD->wB 0

pA:fD->wC 100

pB:fA->wA 300

pB:fA->wB 0

pB:fA->wC 0

pB:fB->wA 0

pB:fB->wB 0

pB:fB->wC 100

pB:fC->wA 0

pB:fC->wB 200

pB:fC->wC 0

pB:fD->wA 100

pB:fD->wB 0

pB:fD->wC 300

Storage in Warehouse:

wA : 700

wB : 600

wC : 700

* Step 3: Now run the model on the data file you produced in Step 1 and report the results. Write them up in a document like you produced last week. Included the .R script you made in Step 1, the model from Step 2, and the output from the scripting output window in OPL. Do not include the .dat file.

1. Problem 2: (12 pts) Complete Problem 12.4-2 from the book using Excel. Include a picture of your spreadsheet (or cut and paste it directly if possible) into your homework submission document.
2. Problem 3: (12 pts) Complete Problem 12.3-1 from the book in OPL. Include your OPL files and the results in your write up. (You may have to read 12.3 and 12.4 carefully to learn how to use binary variables to implement the constraints).

What to hand in this week: You should produce one (rather long) Word document or PDF file that contains clearly labeled solutions for Problems 1-4 above. For Problem 2 you do not need to include the model or data files since they are similar to those in Problem 1. You’ll upload your document to the D2L dropbox for this week’s homework submission.