<u>ASSIGNMENT 1</u> CHE 5480

DUE: Jan 29.

Solve using Excel and GAMS

<u>PROBLEM #1:</u>

A refinery has available two crude oils that have the yields shown in the following table. Because of equipment and storage limitations, production of gasoline, kerosene, and fuel oil must be limited as also shown in this table. There are no plant limitations on the production of other products such as gas oils.

The profit on processing crude #1 is $1.00/bbl and on crude #2 it is $0.70/bbl. Find the approximate optimum daily feed rates of the two crudes to this plant via a graphical method. Solve the problem in Excell and in GAMS.

	Volume percent yields		Maximum allowable product rate (bbl/day)
	Crude #1	Crude #2	
Gasoline	70	31	6,000
Kerosene	6	9	2,400
Fuel Oil	24	60	12,000

<u>PROBLEM #2:</u>

Two possible sites exist for building a new plant, *A* and *B*, and two customer locations are to be supplied, *C* and *D*. Demands and production/supply costs are listed as follows.

Let:

I_i = decision variable (0-1) associated with the decision to build, or not to build, a plant in a given location, and thus incurs the associated fixed daily cost.
C_{ij} = unit cost of supplying customer *j* from plant *i*.
C_i = fixed daily cost of plant *i*.
S_{ij} = quantity supplied from the *i*th plant to the *j*th customer.
R_j = requirement of *j*th customer.
Q_i = capacity of proposed plant.

Production and transport costs per unit:

A to *C*	$1.00
A to *D*	$3.00
B to *C*	$4.50
B to *D*	$1.00

Fixed plant charges per day:

Plant *A*	$700
Plant *B*	$610

Minimum demand (units per day):

Customer *C*	200
Customer *D*	250

Solve the problem for the values of I_1 and I_2 as well as the values of S_{ij}. Each plant has a maximum capacity of 500 units per day.

PROBLEM #3:

An oil refinery has to blend gasoline. Suppose that the refinery wishes to blend four petroleum constituents into three grades of gasoline: *A, B,* and *C*. Determine the mix of the four constituents that will maximize profit.

The availability and costs of the four constituents are given in the following table:

Constituent*	Maximum quantity Available (bbl/day)	Cost Per barrel ($)
1	3000	13.00
2	2000	15.30
3	4000	14.60
4	1000	14.90

*1 = butane , 2 = straight-run, 3 = thermally cracked, 4 = catalytic cracked

To maintain the required quality for each grade of gasoline, it is necessary to specify certain maximum or minimum percentages of the constituents in each blend. These are shown in the following table, along with the selling price for each grade.

Grade	Specification	Selling price per barrel ($)
A	Not more than 15% of 1 Not less than 40% of 2 Not more than 50% of 3	16.20
B	Not more than 10% of 1 Not less than 10% of 2	15.75
C	Not more than 20% of 1	15.30

Assume that all other cash flows are fixed so that the “profit” to be maximized is total sales income minus the total cost of the constituents. Set up a linear programming model for determining the amount and blend of each grade of gasoline.