AGEC 641
Chapter 16 Homework

1.    The Carluchi brothers own a dual purpose slaughter-meat processing facility.  A dual
      purpose plant can slaughter both cattle and hogs, but not both at the same time.
      Furthermore, there are costs associated with switching the kill line from one species to
      another.

      You have been asked to formulate a production plan for the plant.  The plant works on a
      weekly schedule; the kill line closes on the weekend for maintenance.  The plant may
      choose to slaughter cattle only, hogs only, or both.  It will not switch species more than
      once during the week.  Killing capacity is 2000 animals per week.  Other relevant data
      are:

| Species | Start-up costs ($) | Variable slaughter costs per head ($) | Purchase price ($) | Meat yield per head (lb) |
|---------|--------------------|---------------------------------------|--------------------|--------------------------|
| Cattle  | 2000               | 65                                    | 500                | 600                      |
| Hogs    | 1500               | 45                                    | 100                | 150                      |

      The Carluchi brothers use beef and pork to produce country sausage, hot dogs, and spicy
      lunch meat.  Data relevant to these products are

| Product    | Beef (%) | Pork (%) | Selling price ($/lb.) | Processing cost ($/lb) |
|------------|----------|----------|-----------------------|------------------------|
| Sausage    | 0        | 100      | .89                   | .25                    |
| Hot Dogs   | 50       | 50       | 1.09                  | .30                    |
| Lunch Meat | 75       | 25       | 1.59                  | .39                    |

      Formulate a mathematical programming model for the Carluchi brothers.


2.    Suppose Ready Pack containers is trying to determine which consignment items to accept
      for shipping.  Ready Pack has 10,000 cu. ft. of shipping space and can choose among the
      following 12 items:

| Item | Shipping fee collected | cu.. ft. used |
|------|------------------------|----------------|
| 1 | 700 | 700 |
| 2 | 1700 | 1500 |
| 3 | 1200 | 900 |
| 4 | 1500 | 1200 |
| 5 | 3500 | 2600 |
| 6 | 4000 | 3000 |
| 7 | 350 | 300 |
| 8 | 400 | 400 |
| 9 | 710 | 700 |
| 10 | 900 | 1100 |
| 11 | 5700 | 4200 |
| 12 | 1300 | 1200 |

Set up a model to maximize shipping fees subject to the restriction that you must take the whole item or nothing.

3. Set up a GAMS formulation with integer investment variables of your earlier model