1. (6 points) A clinic has $S$ doctors. A schedule needs to be created for the doctors to satisfy the patients’ needs during the working hours of the hospital. The clinic is open for $T$ hours per day. There is a forecast of patients arriving at each hour, and it is denoted by $f_j$, $j=1, \ldots, T$. The time (in hours) needed to attend each patient is 1. Let $b_{ij}=1$ if doctor $i$ works during hour $j$, and $b_{ij}=0$ otherwise.

   a. (2 points) Write a set of constraints to ensure that there are enough doctors working at each hour to attend all the patients forecasted to arrive during that hour.

   b. (2 point) Write the objective function to minimize the total number of doctor hours needed during the day.

   c. (2 points) Formulate a set of constraints to ensure that the work hours of doctor $i$ are consecutive, for all $i=1,\ldots,S$. (For example, if the doctor is working during the hours of 3,4,5, and 6, and is not working on the 7th hour, then he should be off duty for the remaining hours of that day.)

2. (2 points) Please refer to the Big Depot Game case:

   a. (1 points) Uncertainty in the size and the location of a disaster were identified as important factors leading to logistics challenges when planning for a disaster. Among other challenges faced during disaster preparedness and response are (i) the uncertainty in the timing of the disaster (and the resulting demand) and (ii) the uncertainty in supply availability. How are these challenges similar or different from the ones faced during day-to-day operations of a company such as Big-Depot?

   b. (1 points) Big Depot is considering purchasing some generators to be used during emergency situations. Suppose that the regional warehouses are not prepared to store the generators and significant warehousing costs might be incurred in order to have them available when they are needed. These additional warehousing costs are estimated to be in the order of 20% of the generators’ price. Warehousing cost information is owned by the Logistics Department, but the procurement decisions are made by the Merchandising Department. How would this situation impact procurement decisions? Briefly
discuss the importance of information sharing and collaboration across different units of an organization during disaster preparedness and response.

3. (4 points) Refer to this article to answer the following questions:
   Evans, Christopher; Tavakoli, Manouche; Crawford, Bruce; “Use of Quality Adjusted Life Years and Life Years Gained as Benchmarks in Economic Evaluations: A Critical Appraisal”, Health Care Management Science, Vol. 7, Issue 1:pp.43-49, 2004
   To download this article, please go to the webpage:
   http://www.library.gatech.edu/search/databases.php
   Go to the database Web of Science. After you log in, go to “All databases” and search for “qaly” in Topic and “Evans” in Author.
   a. (1 points) Why do the authors state that there is a need for QALY benchmarks in pharmacoeconomic studies?
   b. (2 points) What are the three suggested benchmarks in reporting cost per QALY cited in this article? What are the weaknesses of each benchmark?
   c. (1 points) Which problem is considered to be the most important one by the authors in the current use of benchmarks in pharmaeconomic studies?

4. (3 points) Refer to this article to answer the following questions:
   Neumann, Peter; Greenberg, Dan; “Is the US ready for QALYs?”
   Health Affairs, Vol. 28 (No. 5):pp.1366-71, 2009
   To download this article, please go to the webpage:
   http://www.library.gatech.edu/search/databases.php
   Go to the database Web of Science. After you log in, search for “qaly” in Topic and “Neumann” in Author.
   a. (1 points) What are the controversies of QALY mentioned in this article?
   b. (1 points) Why do the authors disagree with the following claim by other researchers?: “The elicitation method used for QALY determination rarely affects the outcome and the decisions based on the QALY analysis”
   c. (1 points) What are the potential problems for the US using QALY in health related policy decision making?

Note: If you want to submit your homework electronically, please send it to ytle1@gatech.edu. If you want to submit a hardcopy, please bring it to class.