Exam Survival guide for Business Analytics

1. Optimization

- **GAP:**
  - **O**bjective function: Profit/Revenue/Cost/Satisfaction/Fit/Medical? Don't forget Min or Max
  - **D**ecision vars: Make sure each decision alternative is included. If network problem, draw the network and assign a variable to each arrow/connection.
  - **C**onstraints: Watch for key words:

    "<=" constraints: *less than, limit, at most, cannot be, demand, supply, capacity, maximum*

    ">=" constraints: *at least; ensure; minimum*

    "=" constraints: *match; assign*

    Don't forget binary, integer, non-negativity.

    Logical constraints: form if-then relationships (usually X+Y<=1, X>=Y, X<=Y etc.);

2. Risk modeling

- **GAP:** Usually no constraints, instead risks (represented by random variables).
- **Maximax/Maximin/Minimax regret** make sure all states are considered. Don't use probabilities/Expected Values (EVs).
- **Decision trees** (tables can be used instead if preferred):
  Draw tree from left to right (distinguish between decision nodes, random nodes and payoff nodes). Make sure probabilities sum up to 1 for each random node.
- **Calculating Expected values (EV):** when using trees, calculate EV's "from right to left". Make sure you choose highest (lowest if minimizing cost) EV at each decision node, if you make more than one decision (see *lawsuit problem in L4 slides*). Make sure that probabilities sum up to 1 for each EV calculation.

3. Simulation

- **GAP:** similar to risk modeling. When doing simulation use GAP only if you find it useful.
- Each row of your spreadsheet corresponds to a standalone universe. In each universe replica you need all the necessary ingredients to calculate profit/quantities of interest:
- <u>All</u> random events/variables generated in a separate column. If dealing with physical objects, you should use discrete distributions, if financial you must use continuous.
- Generate columns for each step of your simulation. For example, if your objective function is to maximize Profit = Revenue – Cost, create extra columns for Revenue and Cost.
- Make sure your last column of spreadsheet computes the quantity of interest. It can be a forecast/estimate (predictive problems, as in saving for retirement problem) or an objective function to be maximized/minimized (prescriptive problems, as in part b) of the sweatshirts problem in HW4).
- Don't forget to click "calculate now" if you have disabled automatic calculation under "formulas" tab.

General Do's	General Don'ts
Use GAP Words to make sure no info is lost.	Don't use nonlinear operators (e.g. X*Y) when solving LP.
Read problem carefully; there are no "trick" questions/unnecessary info in problem text.	Don't use Excel formulas (e.g. IF, SUMPRODUCT) when you are <u>not</u> in Excel (e.g. in GAP).
Explain your simulation approach in words if your approach is not clear from the Excel file.	Don't get too worked up about the decimals, number of replications, or the precision of answer when simulating.

GOOD LUCK!!!