OM 527 Written Comprehensive Exam Questions - Spring 2021

**Instructions: Please complete the questions described below. Provide your answers in this document, in an Excel file, or in a Jupyter Notebook. Regardless of your choice of tool, make sure you include clear indications of your answers and submit your completed files via Blackboard using the naming convention *Lastname\_Firstname\_527WCE*.**

1. The data provided in the “Supplier\_Ranking” worksheet of the “OM\_527\_WCE\_Questions.xlsx” file provides scores for 100 alternatives on four criteria:
   1. Credit Rating – a grade that indicates the alternative’s financial stability, where possible values are A+, A, A-, B+, B, B-, C+, C, and C-, with an A+ being the best score and a C- being the worst score;
   2. Location – the state where the alternative is located;
   3. Delivery Guarantee – a string indicating the guaranteed time window that the alternative will deliver orders relative to the contracted delivery date; and
   4. Annual Revenue – the reported annual revenue for the company.

Assume that decision-maker has decided to use weights of 0.125, 0.25, 0.375, and 0.25 for the Credit Rating,Location, Delivery Guarantee, and Annual Revenue criteria, respectively. Perform the following tasks.

**Task 1.1 (15 points)**

Map the non-numerical values in the Credit Rating, Location, and Delivery Guarantee to numbers using the following mappings:

* + - Credit Rating
      * A+: 1
      * A: 0.98
      * A-: 0.95
      * B+: 0.9
      * B: 0.8
      * B-: 0.7
      * C+: 0.6
      * C: 0.5
      * C-: 0
    - Location
      * Alabama: 1
      * Tennessee: 0.4
      * Georgia: 0.4
      * Mississippi: 0.4
    - Delivery Guarantee
      * +/- 6 Hours: 1
      * +/- 24 Hours: 0.8
      * NA: 0.2

**See jupyter Notebook**

**Task 1.2 (10 points)**

Rank the suppliers using the weighted product method and identify the top five alternatives (assuming a higher score is better).

See Jupyter Notebook

**Task 1.3 (10 points)**

Considering the data mappings and the data preparation steps taken, discuss any potential issues that may be associated with the ranking performed in Task 1.2

The weighted product method is a lot more harsh on a particular category and you can immediately disqualify someone if they have a 0 in any 1 category (0 raised to a weight is still 0 then you multiply it through). This could be intentional if credit\_score really should disqualify someone immediately.

**Task 1.4 (10 points)**

For any issues identified in Task 1.3 **that are specifically related to data preparation**, describe how the data preparation may be revised to overcome the issues. If a method is proposed, please show a simple example of its application.

The best method would be to take an ensemble approach, although a meeting with the relevant stakeholders could also be a good option to determine if there really should be a value that could result in immediate disqualification. There is an Ensemble Method that is shown in the workbook. The general lack of variability would indicate it is probably not needed as there is stiff competition for the top spot, but if the Alternatives were to decrease quality it would be worth considering a revised ranking method or a potential revision of the weights with input from relevant stakeholders on the selection of the alternatives.

1. The data provided in the “Spend\_Analysis” worksheet of the “OM\_527\_WCE\_Questions.xlsx” file provides information regarding transactions made by various departments of a company and their vendors (each row represents a transactions). Use the data to:
   1. Identify the purchasing department(s) responsible for the highest total spend across all vendors. **(15 points)**

**See notebook**

* 1. Identify the vendor(s) involved in transactions with the highest number of unique departments. **(15 points)**

**See notebook**

* 1. If you were asked to recommend a vendor for additional price negotiations, which vendor would you select and how would you justify your selection? **(15 points)**

**Vendor 7, since they are involved with the most departments and we have the highest aggregate spend with that vendor (see notebook for specifics)**

3392618.94 is sum of spend

6 Departments interact

1. Suppose that you are attempting to determine weight values for a supplier selection task. Which of the following techniques is most applicable to the task of **identifying weight values that are consistent with stakeholder preferences**? **(10 points)**
2. Monte Carlo Simulation
3. Stochastic programming
4. Weighted Sum Method
5. Analytic Hierarchy Process (AHP)

The AHP process is a method to do pairwise comparisons to help determine what the weights for a MCDM type operation would be.