Exam 2

ISE 754: Logistics Engineering **Fall 2020**

Assigned: 12p, Thu, 5 Nov Due: 9p, Fri, 6 Nov

This exam consists of two problems that you should solve by yourself outside of class. The exam is open book, open notes, and open software. This is an individual exam, and due consideration will be given to the fact that you are working on your own and thus will be producing original and unique work, not to mention the possibility that you might make several minor errors due to the pressure of working under a deadline. If the Instructor has determined that you have collaborated with anyone else on the exam, the few points that you might lose due to these types of minor errors will be far less than the penalty associated with the violation of academic integrity that you would receive.

Instructions:

For each problem, you should provide a concise summary that includes (a) a single paragraph describing your overall approach and final result, (b) justification of all significant assumptions, and (c) a verbal description of your procedure for solving each major non-standard step in your approach (you can just reference any standard approach covered in class without description). The summary will be reviewed first when grading each problem. If you are not able to computationally solve the problem, then partial credit will be given if you describe a basically correct approach in your summary.

You should submit an electronic copy of your results via Moodle, including all text and Matlab files that you have created. Also, make sure you have installed the latest updates to Matlog; an email will be sent to notify you if any updates occur during the exam period.

Problem 1: 50 pts

Artilugio, LLC, ships two different raw materials via TL between its fabrication facility in Amarillo, TX, and its assembly plant in Anderson, SC. Each unit of each material occupies 6 and 3 ft^3, weighs 12 and 96 lb, and costs \$120 and \$80 to fabricate, respectively. A 13-week rolling horizon is used for planning transportation. Each material's forecasted weekly demand is 64, 64, 56, 31, 166, 62, 53, 96, 126, 143, 39, 45, and 55 units and 125, 101, 40, 26, 89, 104, 87, 22, 57, 81, 297, 163, and 113 units, respectively. Currently, 77 and 100 units of each material, respectively, are in storage at the Anderson plant, and the same amounts should be in storage at the end of the planning period. Assuming that each material loses 20% and 10%, respectively, of its value after 13 weeks in storage, any amount of each material can be fabricated and transported each week, and both materials can be shipped on the same truck, determine the transportation plan that minimizes total costs over the planning horizon and what those total costs will be.

Problem 2: 50 pts

Osborn, Inc., has a DC in Detroit, MI that supplies 45 customers each day with cases of different products using tractor-trailers. Given tomorrow's demand, determine the number of trucks required to supply the customers and the route of each truck. Customer location, load density (in lb/ft^3), and weight (in lb) of each load for each customer are in the spreadsheet *Exam2DataF29.xlsx*. A load can be split between multiple trucks. The spreadsheet includes the location of the depot (customer 1). Each identical truck must start and complete its route between 7 a.m. and 5 p.m., including travel and unloading time. Each truck requires 20 minutes for loading at the depot. It can be loaded at the depot before 7 a.m., and this loading time should not be included in the 10-hour total, but if the truck is used for more than a single route, the 20 minutes should be included in the 10-hour total. Unloading at each customer takes five minutes for positioning the truck and five minutes per ton of the load.