HW 6: Freight Transport

ISE 754: Logistics Engineering **Spring 2019**

Assigned: Mon, 25 Feb (Groups of 2) Due: 2:30p, Mon, 4 Mar

Solve questions 1 and 4 by hand (you can submit a scanned copy of your solution, or you can just turn in a paper copy in class) and then, for questions 2, 3, and 5, create a script in Matlab that performs the calculations needed to answer each question, one cell for each part of each question. Please submit your script and either diary or "published" output file via Moodle.

1. What is the difference in the transport charge to ship 25 cartons of a product LTL from Raleigh to Gainesville using the undiscounted tariff given below as compared to using the LTL rate estimation formula with a PPI of 144.3? Each carton weighs 70 pounds and occupies twenty cubic feet.

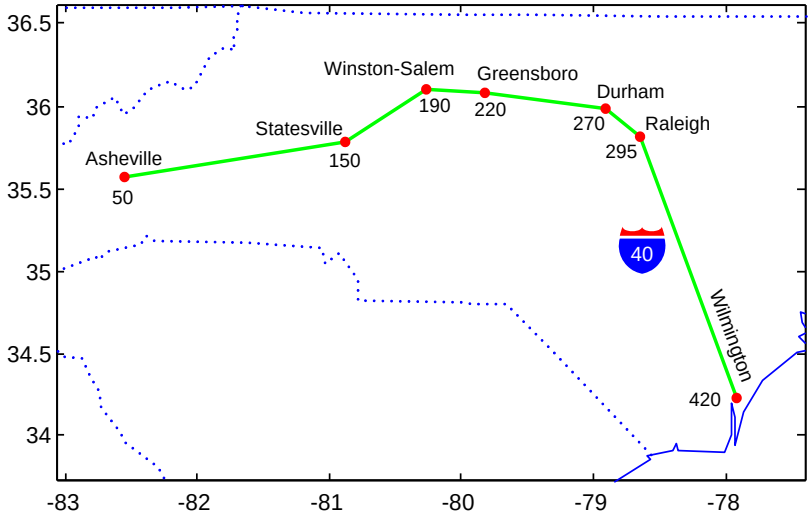
Table 1.4. Tariff (in $/cwt) from Raleigh, NC (27606) to Gainesville, FL (32606) (532 mi, CzarLite DEMOCZ02 04-01-2000, minimum charge = $95.23)

Freight Class	Rate Breaks (i)								
	1	2	3	4	5	6	7	8	9&10
500	341.42	314.14	245.80	201.48	158.60	112.37	55.66	55.66	55.66
400	273.88	251.99	197.19	161.61	127.22	91.12	45.10	45.10	45.10
300	206.34	189.85	148.56	121.76	95.85	69.47	34.43	34.43	34.43
250	172.56	158.77	124.23	101.83	80.15	58.03	28.79	28.79	28.79
200	138.78	127.69	99.92	81.89	64.47	47.19	23.40	23.40	23.40
175	121.37	111.68	87.39	71.62	56.38	41.27	20.39	20.39	20.39
150	104.49	96.13	75.22	61.66	48.53	35.96	17.75	17.75	17.75
125	87.59	80.60	63.07	51.69	40.69	30.24	15.00	15.00	15.00
110	77.57	71.37	55.85	45.77	36.04	28.61	14.40	14.40	14.40
100	71.23	65.55	51.29	42.04	33.09	27.58	14.03	10.80	9.90
92	66.48	61.18	47.88	39.24	30.89	25.75	13.68	10.52	9.66
85	61.74	56.80	44.45	36.43	28.68	23.91	13.20	10.15	9.32
77	56.99	52.44	41.04	33.63	26.48	22.07	12.60	9.68	8.89
70	52.77	48.55	37.99	31.14	24.51	20.43	12.00	9.23	8.47
65	50.07	46.08	36.05	29.56	23.04	19.39	11.87	9.14	8.39
60	47.44	43.64	34.15	28.00	21.82	18.37	11.76	9.04	8.30
55	44.75	41.17	32.22	26.40	20.59	17.32	11.64	8.96	8.22
50	41.57	38.26	29.94	24.54	19.12	16.10	11.52	8.85	8.14
Tons (q_i^B)	0.25	0.5	1	2.5	5	10	15	20	∞

2. On average, 75 tons of a product are shipped 625 miles from your manufacturing plant to your DC each year. The product is produced and consumed at a constant rate throughout the year. Currently, the product is shipped using independent P2P truckloads. What would be the impact on total annual logistics costs if the average interval between shipments was restricted to not exceeding one week and, if the shipment size is equal to one week's demand, then both TL and LTL are considered? The PPIs for TL and LTL are

123.4 and 141.4, respectively; a truck's cubic and weight capacities are 2,750 ft^3 and 25 tons, respectively; each ton of the product is valued at $12,000; its density of 12 lb per ft^3; the inventory carrying rate is 30%; and in-transit inventory costs can be ignored.

3. On average, 1000 and 1200 units of components A and B are shipped 500 miles from your fabrication plant to your assembly plant each year. The components are produced in batches just prior to shipping and are consumed at a constant rate throughout the year. Currently, each component is shipped using separate P2P truckloads. What would be the impact on total annual logistics costs if the components are instead combined into P2P truckloads? The revenue per loaded truck-mile is $2.00; a truck's cubic and weight capacities are 2,750 ft^3 and 25 tons, respectively; each unit of A and B is valued at $30 and $45, respectively, weighs 24 and 45 lb, respectively, occupies 12 and 4 ft^3, respectively, and loses 60% of its original value after two and three years, respectively; the interest and warehousing carrying rates are 4% and 6%, respectively; and in-transit inventory costs can be ignored.



4. It is expected that 400 and 120 tons of products A and B, respectively, will be shipped each year from your DC to five customers located in Asheville, Winston-Salem, Greensboro, Durham, and Raleigh, with each customer receiving 20, 25, 30, 15, and 10 percent of the total demand, respectively. Full P2P truckloads of A and B will be shipped FOB origin to the DC from suppliers located in Statesville and Wilmington, respectively, and full P2P truckloads containing a mix of both products will be shipped FOB destination to each customer. Each carton of A and B weighs 100 and 50 lb, respectively, and occupies 25 and 5 ft^3, respectively. Each truck's cubic and weight capacity is 2,750 ft^3 and 25 tons, respectively. Assuming that I-40 will be used for all travel (see figure, above), where should the DC be located in order to minimize transportation costs?

5. iChain, Inc., has just purchased a DC that is located in Durham, NC to serve its retail facilities located in VA, NC, and SC. The DC will receive product from suppliers located throughout the U.S. Independent P2P TL or LTL will be used for all transport, and product is consumed at a constant rate at all of the retail facilities. Determine the transshipment policy that iChain should use to operate the DC, where you should decide if all products should be stocked with no coordination or should all be cross-docked using a single shipment interval. The worksheet *Supplier* of the spreadsheet *HW6data.xlsx* (see Course Schedule for data link) lists the Zip code (*zip*), volume (*cu*, ft^3), weight (*wt*, lb), cost (*uc*, $), and salvage value after one year (*sv*, $) of each unit of 64 different products. The worksheet *Customer* lists the Zip code (*zip*) of each of the 28 retail facilities, and the worksheet *Demand* lists annual unit demand of each product for each retail facility.