BANA4095 – Exam 2
Spring 2020

You will have 120 minutes to complete this exam, and you may use your textbook, lecture notes, and other resources from the course to complete this exam. However, you may NOT access resources on the internet or communicate with anyone other than the instructor. Read each question ***carefully*** and make sure that you answer each question ***completely***. You should download the template files from the Exam 2 link in Canvas, and upload your files back in the Exam 2 link in Canvas when you are finished.

1. (35) John Sweeney is an investment advisor who is attempting to construct an "optimal portfolio" for a client who has $400,000 cash to invest. There are seven different investments, falling into three broad categories that John and his client have identified as potential candidates for this portfolio.
The following table lists the investments and their important characteristics.

Category	Investment	Expected Annual After-Tax Return	Liquidity Factor	Risk Factor
Equities	Unidyne Corp.	15.0%	100	60
	Col. Mustard Restaurant	17.0%	100	70
	First General REIT	17.5%	100	75
Debt	Metropolitan Electric	11.8%	95	20
	Western Union Corp.	12.2%	92	30
	Lemonville Transit	12.0%	79	22
Real Estate	Fairview Apartment Partnership	22.0%	0	50

A linear program model is formulated using Python to accomplish John's objective as an investment advisor, which is to construct a portfolio that maximizes his client's total expected after-tax return over the next year, subject to the following constraints placed upon him by the client for the portfolio:

i. Its (weighted) average liquidity factor must be at least 65.
ii. The (weighted) average risk factor must be no greater than 55.
iii. No more than 20% of the investment can be in any one investment
iv. The minimum investment desired for debt is $90,000.

Complete the partially implemented model in the file Exam2.1_template.ipynb to find an optimal solution.

2. (65) A clothing distributor has three warehouses that serve four sales regions: North East (NE), North West (NW), South East (SE) and South West (SW). Each warehouse has a monthly capacity of 4,000 blue jeans. It is considering using a transportation LP approach to match demand and capacity. The following table provides data on shipping cost and demand constraints on a per-month basis.

Warehouse	NE	NW	SE	SW
Cincinnati	0.53	0.21	0.52	0.41
Little Rock	0.31	0.38	0.41	0.29
Portland	0.56	0.32	0.54	0.33
Region Demand	2,000	3,000	3,500	5,500

a. (40) Construct an optimization model using Python in a Jupyter Notebook and use it to find an optimal solution for this problem as well as the region whose demand will not be satisfied

b. (25) Describe how the optimal value changes as the shipping cost from Little Rock to "SE" changes from $0.20 to $0.55.