SYS 5130 Project 1 – Transportations

- Submit your report on course website, Brightspace. Deadline: **Nov 9, 11pm**.
- Presentation: **Nov 10** (Wednesday's class). Around 3 minutes each.
- Total 10 points.

Marking scheme:

- 40%: Project quality
- 30%: Correct Calculations
- 20%: Report quality
- 10%: DEMO

1. (3 points) The area Cotton Valley, comprises an irrigated region that is approximately 10 miles in length and varies from a half mile to two miles in width. Situated within this region are three cotton-producing farms. Collectively, these farms yield **80** bales of high-quality Upland cotton and **30** bales of American Pima during the cotton season. Individually, however, the three farms differ as to their size, production efficiency, and actual output. The total output, including Upland and Pima, of the largest farm in the area is **60** bales per season. The next smaller and smallest farms produce **30** and **20** total bales per season, respectively.

Cotton Valley also contains two large cotton gins. Both gins are owned and operated by the Cotton Valley Co-op, in which the three cotton farmers have vested interests. It makes no difference to the farmers, therefore, which gin processes their cotton, as long as the costs incurred by the Co-op are kept to a minimum.

The larger of the two gins is called the Turner Gin. It received its name from the local politician who donated to the Co-op the land on which the gin was built. The Turner Gin has the capacity to process **180** bales of Cotton per season, regardless of the type. The smaller gin is called the Sloe Gin. There never was a Mr. Sloe in the valley. The name stems from the fact

that the gin is surrounded by sloe bushes. The Sloe Gin has a **150** bale per season capacity, also regardless of the type.

It should be noted that either one of the gins has the capacity to process the entire cotton output of the valley. This was not always the case. At one time, there were nine farms in the valley capable of producing a total of over 275 bales of cotton per season. However, poor economic conditions, bad weather, and a general declining interest in cotton farming have combined to greatly reduce the valley's cotton production.

The owner of the smallest farm, Mr. Green, constantly has to watch his pennies to keep from going bankrupt. He, therefore, introduced a motion at a meeting of the stockholders of the Cotton Valley Co-op that required the Co-op to minimize the costs of transporting cotton from the farms to the gins. The motion was quickly seconded and unanimously agreed to by all present at the meeting. “Crazy” Harry, the local crop duster, agreed to fly over the valley, taking pictures with his Instamatic. From these pictures, the distance from each farm to each gin could be meticulously calculated. It was then a simple matter to determine the shipping costs associated with transporting a single bale of cotton from any farm, to any gin. The chart below indicates these costs.

	Turner Gin	**Sloe Gin**
Large Farm	1	1
Medium Farm	3	2
Small Farm	1	2

The Co-op has hired you, a non-expert in the management science field, to model and solve the problem stated above.

2. (4 points) Your presentation of the transportation problem you solved for the farmers Co-op was so lucid that the farmers were made aware of certain limitations in your model. As farmer Green pointed out, he does not pick all his cotton at one time and then ship it out. He picks continually through the week and ships all the cotton picked in one week to the gin on Friday (the farmers are always talking of their Friday "gin" money). Any picked cotton not sent to the gin must be field-protected at a cost of one dollar per bale per week to protect it from the weather. Farmer Green and the other farmers

know from experience that it will take two weeks to pick all of the cotton land planted. Rip Masterson, the owner and operator of the largest farm, in the valley tells you that he is the foreman of the picking crews and gives you the following numbers on the output of each farm by week.

	Week 1	**Week 2**
Large farm (Rip's)	30	30
Medium farm	10	20
Small farm (Green's)	10	10

Being a brighter than average MBA student you realize that the cotton gin must have weekly capacities also. After doing some checking, you find that the Turner Gin will only be operating for three weeks and can only process a maximum of 60 bales a week. The Sloe Gin will be operating the same three weeks, but the maximum number of bales it can process in one week is 50.

You tell the Co-op at the next weekly meeting that with the information you now have you can solve a model of their problem that will give them the lowest total shipping and storage costs. They put it to a vote and give you the go ahead.

3. (3 points) Suppose you have 1000 USD. Rate is 1USD-->1.3CND. Due to buy-sell rate difference, the exchange rate is: 1CND-->0.77USD.

Find the maximum output (in CND) in each of the following cases:

(a) All capacities are 9999.
(b) All capacities are 99999.

Remember: network.exe only gives minimum.