Handbook of
Excel to Gurobi for Network Models

STEP 1:

Input the data into the cells of the chosen sheet of the attached Excel file (see appendix).

	A	B	C	D	E	F	G
1	**Objective**	min					
2	**Variable Type**						
3	**non-neg?**	Y					
4	**Problem Type**	MCNF					
5							
6							
7	**START HERE**	**Edmonton**	**Toronto**	**Ottawa**		**FLOW IN = OUT (Y/N)**	**SUPPLY**
8	**Winnipeg**	5	4	3		N	100
9	**Montreal**	3	2	1		N	300
10	**Halifax**	9	7	5		N	300
11							
12	**DEMAND**	300	200	200			

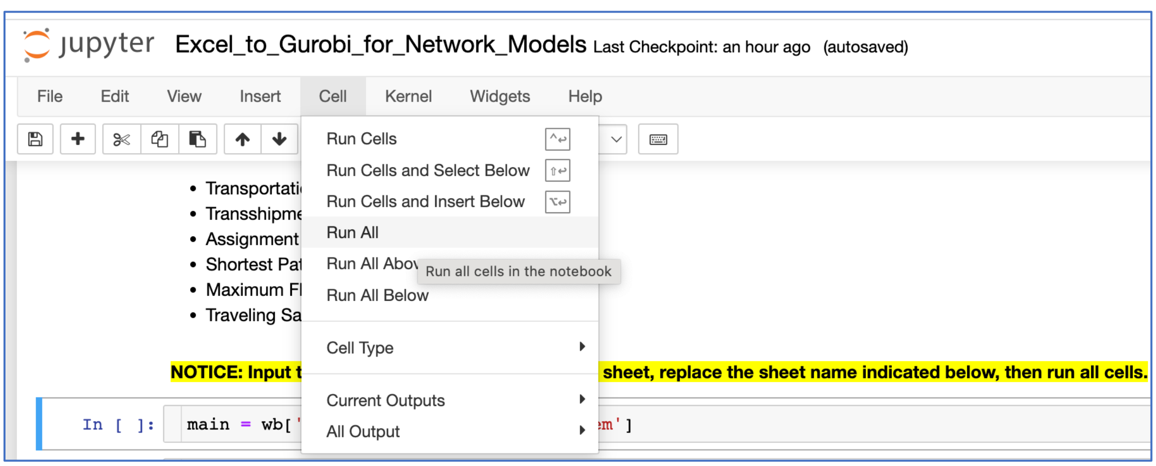
STEP 2:

Replace the sheet name in the Jupyter Notebook file.

```
main = wb['Transportation Problem']
```

STEP 3:

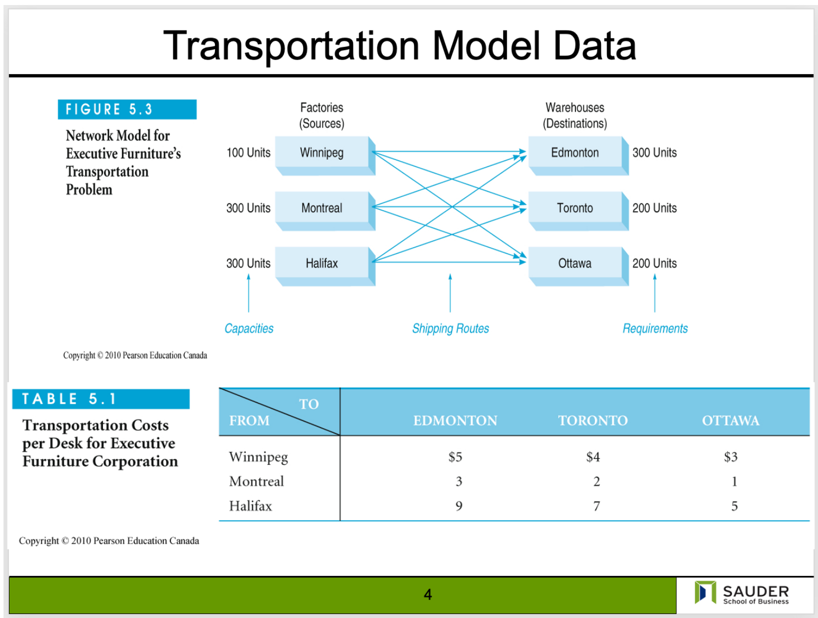
Run all cells.



Appendix

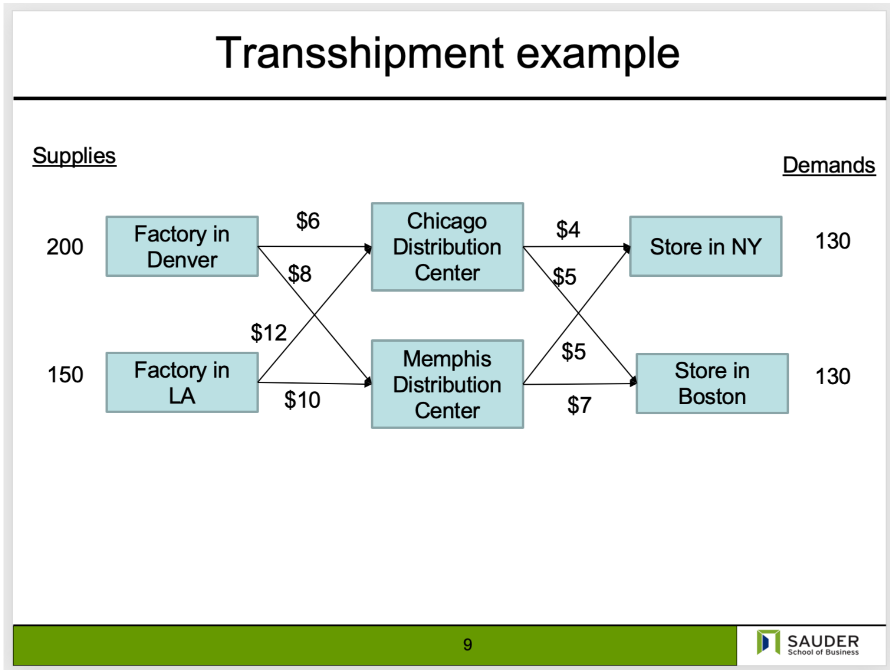
Note: The first pictures of Examples 1 to 5 are quoted from the PowerPoint “Network Models” created by Professor Steven Shechter for the course “Optimal Decision Making II.” The second picture of the examples is the completed Excel sheet based on the information of first picture.

Example 1: Transportation Problem



	A	B	C	D	E	F	G
1	**Objective**	min					
2	**Variable Type**						
3	**non-neg?**	Y					
4	**Problem Type**	MCNF					
5							
6							
7	**START HERE**	**Edmonton**	**Toronto**	**Ottawa**		**FLOW IN = OUT (Y/N)**	**SUPPLY**
8	**Winnipeg**	5	4	3		N	100
9	**Montreal**	3	2	1		N	300
10	**Halifax**	9	7	5		N	300
11							
12	**DEMAND**	300	200	200			

Example 2: Transshipment Problem



	A	B	C	D	E	F	G	H
1	**Objective**	min						
2	**Variable Type**							
3	**non-neg?**	Y						
4	**Problem Type**	MCNF						
5								
6								
7	**START HERE**	**Chicago**	**Memphis**	**NY**	**Boston**		**FLOW IN = OUT (Y/N)**	**SUPPLY**
8	**Denver**	6	8				N	200
9	**LA**	12	10				N	150
10	**Chicago**			4	5		Y	
11	**Memphis**			5	7		Y	
12								
13	**DEMAND**			130	130			

Example 3: Assignment Problem

Assignment Problem: Employees to Tasks

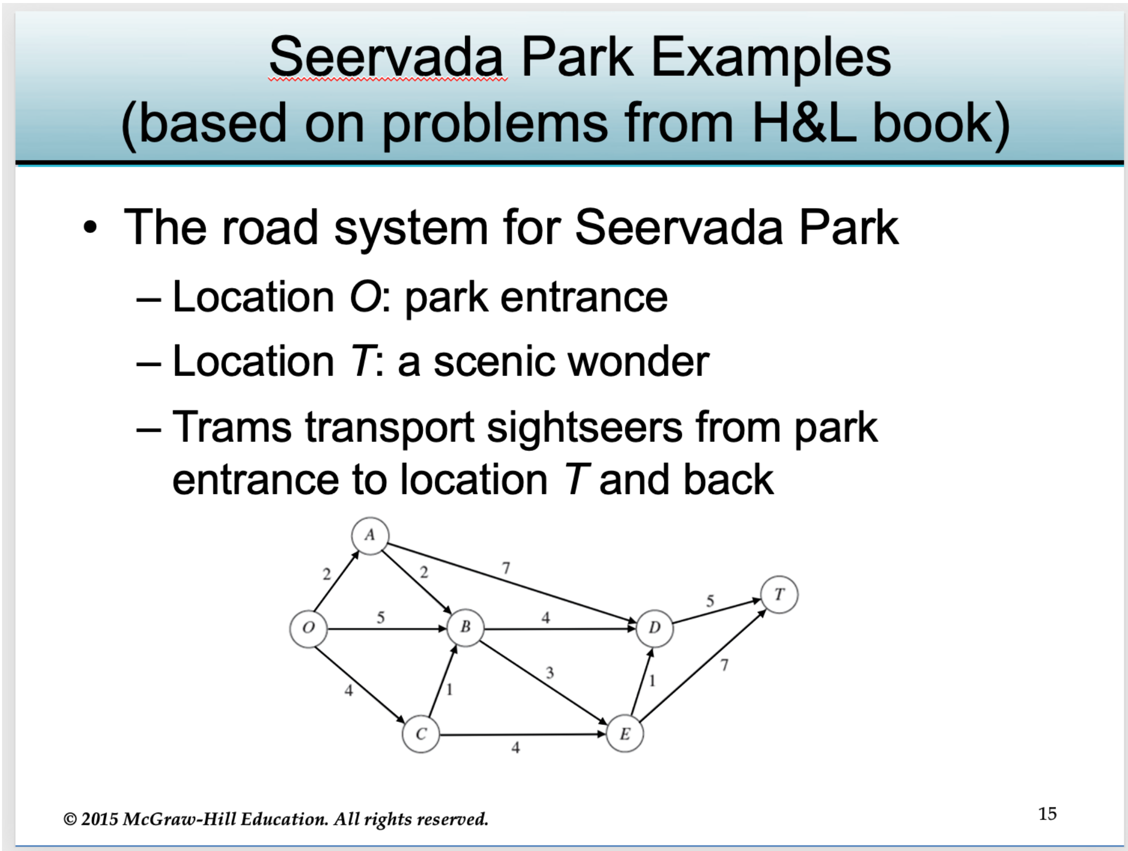
- 4 employees are available to work on 4 tasks.
- The time it would take each employee to complete each task (in hours) is given by this table:

	Task 1	Task 2	Task 3	Task 4
Employee 1	7	3	4	8
Employee 2	5	4	6	5
Employee 3	6	7	15	6
Employee 4	8	6	7	4

- Decision: Which employee do you assign to which task to minimize total hours worked?

	A	B	C	D	E	F	G	H
1	**Objective**	min						
2	**Variable Type**							
3	**non-neg?**	Y						
4	**Problem Type**	MCNF						
5								
6								
7	**START HERE**	**Task_1**	**Task_2**	**Task_3**	**Task_4**		**FLOW IN = OUT (Y/N)**	**SUPPLY**
8	**Employee_1**	7	3	4	8		N	1
9	**Employee_2**	5	4	6	5		N	1
10	**Employee_3**	6	7	15	6		N	1
11	**Employee_4**	8	6	7	4		N	1
12								
13	**DEMAND**	1	1	1	1			

Example 4: Shortest Path Problem

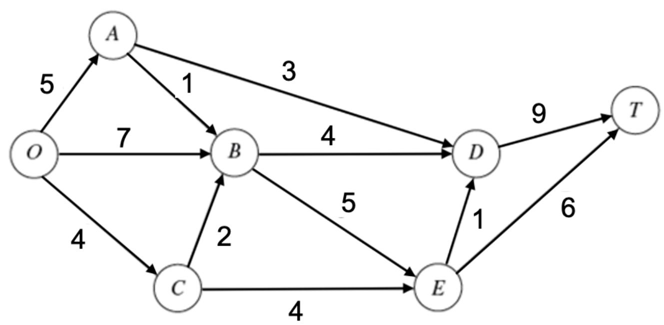


	A	B	C	D	E	F	G	H	I	J
1	Objective	min								
2	Variable Type									
3	non-neg?	Y								
4	Problem Type	MCNF								
5										
6										
7	START HERE	A	B	C	D	E	T		FLOW IN = OUT (Y/N)	SUPPLY
8	O	2	5	4					N	1
9	A		2		7				Y	
10	B				4	3			Y	
11	C		1			4			Y	
12	D						5		Y	
13	E				1		7		Y	
14										
15	DEMAND						1			

Example 5: Maximum Flow Problem

Maximum Flow Problem

- Seervada Park wants to determine the maximum number of trams they can send from O to T per day, and how to route them to achieve this max flow.
- To avoid disturbing the wildlife too much each day, park management has decided to limit the number of tram rides per day on each road, as shown in the diagram:



- How can we formulate this as a MCNF problem?

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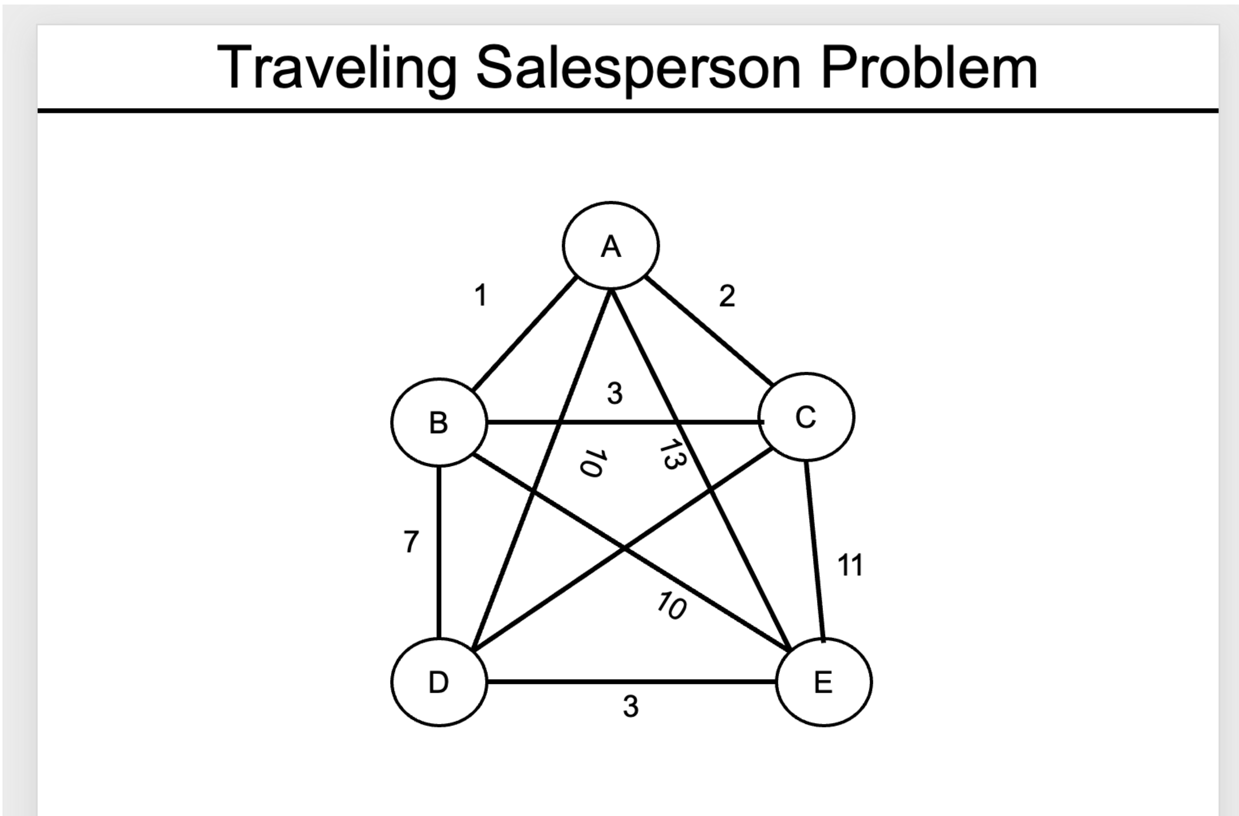
	A	B	C	D	E	F	G	H	I	J	K
1	**Objective**	min									
2	**Variable Type**										
3	**non-neg?**	Y									
4	**Problem Type**	MFP									
5											
6											
7	**START HERE**	**A**	**B**	**C**	**D**	**E**	**T**	**O**		**FLOW IN = OUT (Y/N)**	**SUPPLY**
8	**O**	5	7	4						Y	
9	**A**		1		3					Y	
10	**B**				4	5				Y	
11	**C**		2			4				Y	
12	**D**						9			Y	
13	**E**				1		6			Y	
14	**T**							9999999		Y	
15											
16	**DEMAND**										

Example 6: Traveling Salesperson Problem



	A	B	C	D	E	F	G	H	I
1	**Objective**	min							
2	**Variable Type**	int							
3	**non-neg?**	Y							
4	**Problem Type**	TSP							
5									
6									
7	**START HERE**	**A**	**B**	**C**	**D**	**E**		**FLOW IN = OUT (Y/N)**	**SUPPLY**
8	**A**		1	2	10	13		Y	1
9	**B**	1		3	7	10		Y	1
10	**C**	2	3		9	11		Y	1
11	**D**	10	7	10		3		Y	1
12	**E**	8	9	11	4			Y	1
13									
14	**DEMAND**	1	1	1	1	1			