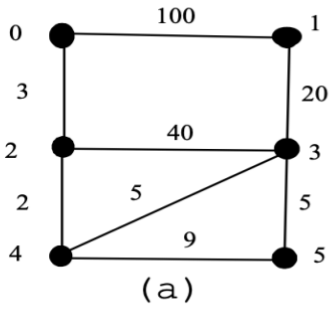
Assignment

1. (*Finding a minimum spanning tree*) Write a program that reads a connected graph from a file and displays its minimum spanning tree. The first line in the file contains a number that indicates the number of vertices (n). The vertices are labeled as **0**, **1**, ..., **n-1**. Each subsequent line describes the edges in the form of **u1, v1, w1 | u2, v2, w2 | ....** Each triplet in this form describes an edge and its weight. Figure 1 shows an example of the file for the corresponding graph. Note that we assume the graph is undirected. If the graph has an edge (**u**, **v**), it also has an edge (**v**, **u**). Only one edge is represented in the file. When you construct a graph, both edges need to be considered.




```
File
6
0, 1, 100 | 0, 2, 3
1, 3, 20
2, 3, 40 | 2, 4, 2
3, 4, 5 | 3, 5, 5
4, 5, 9
```

(b)

Figure 1 The vertices and edges of a weighted graph can be stored in a

Your program should prompt the user to enter the name of the file, should read data from a file, create an instance **g** of **WeightedGraph**, invoke **g.printWeightedEdges()** to display all edges, invoke **getMinimumSpanningTree()** to obtain an instance **tree** of **WeightedGraph.MST**, invoke **tree.getTotalWeight()** to display the weight of the minimum spanning tree, and invoke **tree.printTree()** to display the tree. Here is a sample run of the program:

```
<Output>
Enter a file name: c:\exercise\Exercise23_9.txt
The number of vertices is 6
Vertex 0: (0, 2, 3) (0, 1, 100)
Vertex 1: (1, 3, 20) (1, 0, 100)
Vertex 2: (2, 4, 2) (2, 3, 40) (2, 0, 3)
Vertex 3: (3, 4, 5) (3, 5, 5) (3, 1, 20) (3, 2, 40)
Vertex 4: (4, 2, 2) (4, 3, 5) (4, 5, 9)
Vertex 5: (5, 3, 5) (5, 4, 9)
Total weight is 35


Root is: 0
Edges: (3, 1) (0, 2) (4, 3) (2, 4) (3, 5)
<End Output>
```

(*Hint*: Use **new WeightedGraph(list, numberOfVertices)** to create a graph, where **list** contains a list of **WeightedEdge** objects. Use **new WeightedEdge(u, v, w)** to create an

edge. Read the first line to get the number of vertices. Read each subsequent line into a string **s** and use **s.split("[\\|]")** to extract the triplets. For each triplet, **triplet.split("[,]")** to extract vertices and weight.)