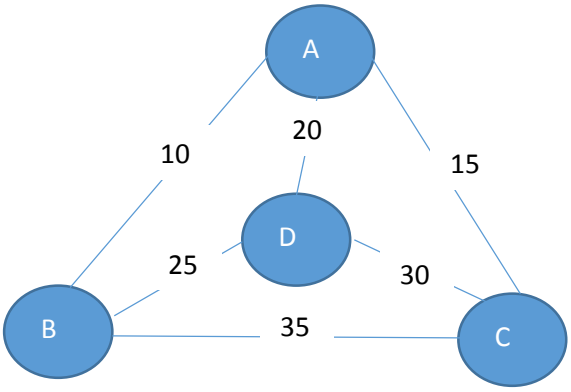
Assignment (Graphs and Paths)

You may do this assignment in teams of two. When you make the submission, make sure you put both your names down.

Travelling Salesman Problem (TSP) – Naïve Version

Given a set of cities and distances between every pair of cities, the problem is to find the shortest possible route that visits every city exactly once and returns to the starting point. (Note: This is different from the problem of computing the Hamiltonian cycle which is to compute a path that visits every city exactly once.) In the case of the TSP we know that a Hamiltonian cycle exists because the graph is complete, but because many such cycles exist, we are interested in finding the shortest.

For example, consider the graph shown below:



A TSP tour in the graph is A→B→D→C→A. The cost of the TSP tour is 10+25+30+15 which is 80.

To do….

1.) Implement the following naïve solution:
   a. Consider city A as the starting point
   b. Generate all possible paths from A through all the nodes in the graph and back to A
   c. Calculate the cost of the paths and keep track of the minimum cost path
   d. Return the minimum cost path.
2.) Propose a more efficient solution and provide a performance evaluation of your solution compared to the naïve implementation.
3.) Provide a brief report – 2 pages maximum to describe your solution. (You may state additional contributions you made to the assignment – this irrespective of whether or not they worked.)

A few notes…

1.) You may generate a sample data file of your choosing and make that available on submission of your assignment *(Some advice … start by testing your code with the example given above.)*

2.) Your code should be able to accept input from this file and output a shortest path computed based on the graph data stored in the file.