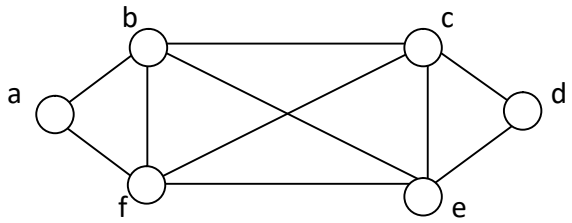
CS4335. Design and Analysis of Algorithms

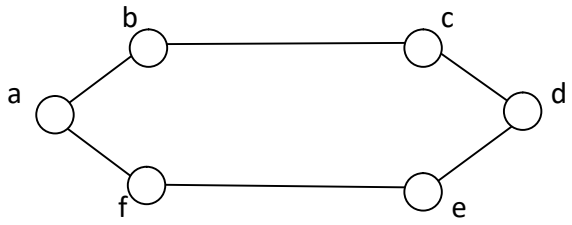
Tutorial 1 - Solution

Solution For Exercise 1:

Label the vertexes as:

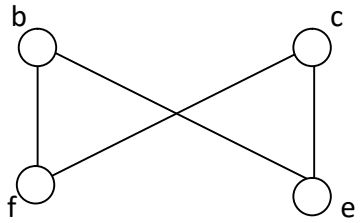


Step 1. Randomly select vertex ‘a’. Find a circuit starts from ‘a’ and ends at ‘a’:



C1: a-----> b-----> c-----> d-----> e-----> f----->a

Step 2. The rest of the graph looks like:



Check every vertex in C1 and see if there is an unused edge for some vertex in C1. Here we find vertex ‘b’. Find a circuit starts from ‘b’ and ends with ‘b’:

b-----> e ----> c-----> f-----> b

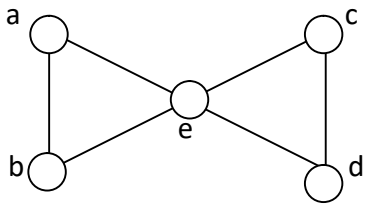
Step 3.

Merge two circuits found in step 1 and step 2 by using the second circuit to replace vertex ‘b’ in the first circuit)

C: a----->**b-----> e ----> c-----> f-----> b**-----> c-----> d-----> e-----> f----->a

Step 4: Check every vertex in C and see if there is an unused edge for some vertex in C. Answer is no for C, so ALL edges are used and we stop the algorithm.

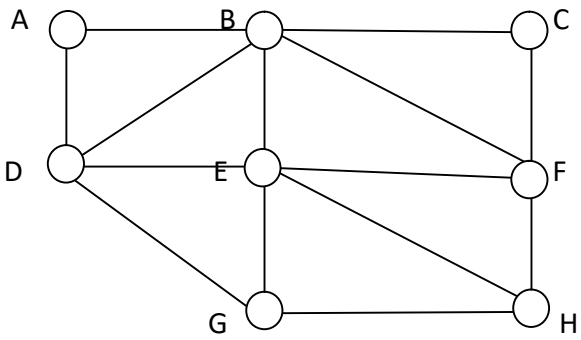
Solution for Exercise 2:



Take the above graph as an example. All the vertexes have even degree.
Look at the two components {a, b} and {c, d}.
Assume that the Hamilton circuit starts from component {a, b}. It must move from {a, b} to {c, d}. The only way to do that is to use vertex e.
After using e to reach {c, d}, there is no way to come back to {a, b}.
Hence, no Hamilton circuit exists in this graph.

Solution for Question:

Convert the map into graph:



- The problem becomes to find an Euler circuit for the constructed graph.
- In this graph, we can see the degree of 'G' is 3, which is not even.
- So the tour does not exist.