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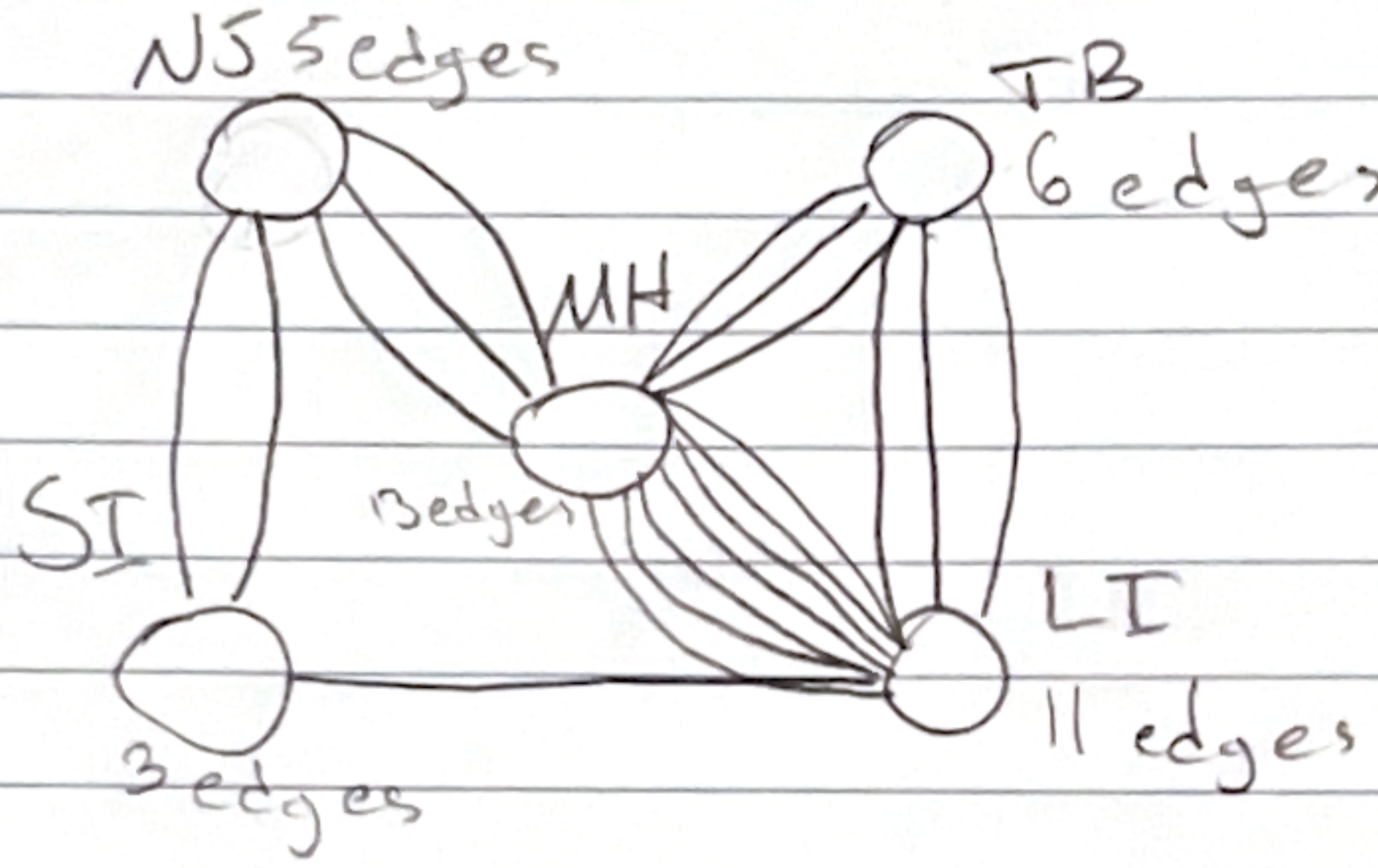
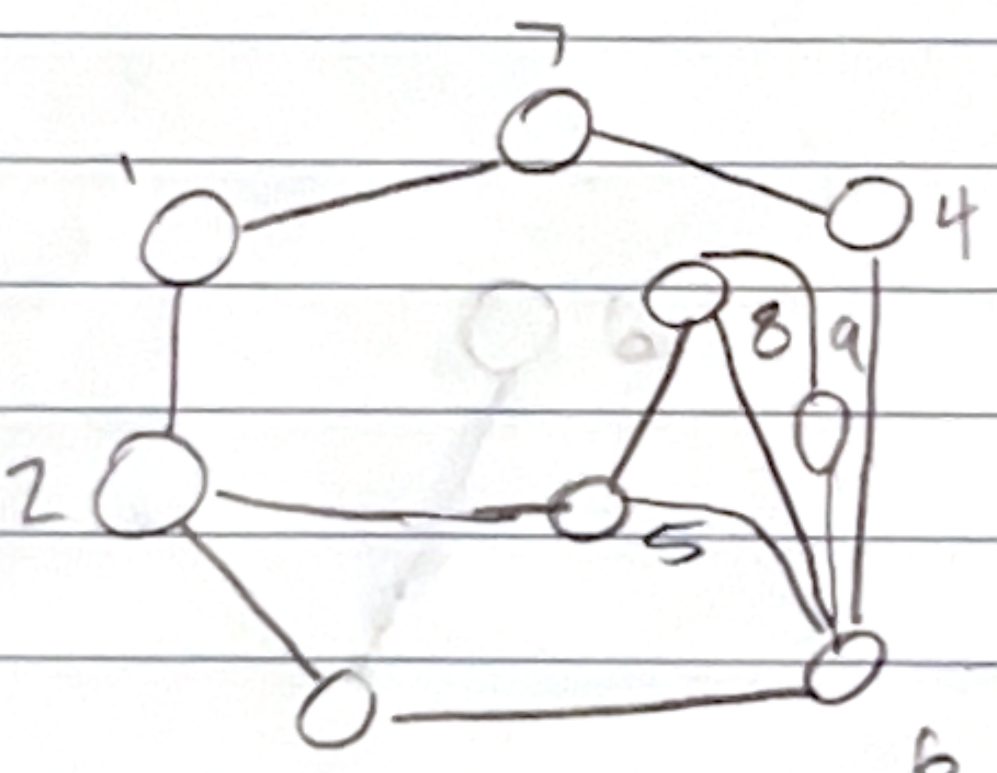
COSC 594 Homework #1

1.



There is no Eulerian trail for this graph, since there are 4 vertices with odd degree. A single new bridge between any two of the vertices with odd degree would allow for an Eulerian path, which would start at one of the remaining vertices with odd degree and end at the other. ∎

2.



The minimum degree of this graph is 2, shared by vertices 1, 3, 4, 7, and 9. The maximum degree is 5 @ vertex 6. The graph density is the number of edges divided by the number of possible edges (36). $12/36 = \frac{1}{3}$, which is the graph density.

3. The minimum occurs when the tree is a path, with no other vertices. In this case, there are 2 vertices with degree 1. If you had a tree with one vertex in the middle, and every other vertex connected only to the middle vertex, you'd have n-1 leaves. An algorithm that finds number of leaves would essentially be checking for nodes of degree 1. We could create a map<int (vertex #), int (degree)> degrees, with an entry like {x,0}, and iterate through the upper half of the adjacency matrix. For every 1, we increment value associated with the column and row. After, we return the number of elements whose value is still 1.