CSE 595 Independent Study

Graph Theory

Week 1

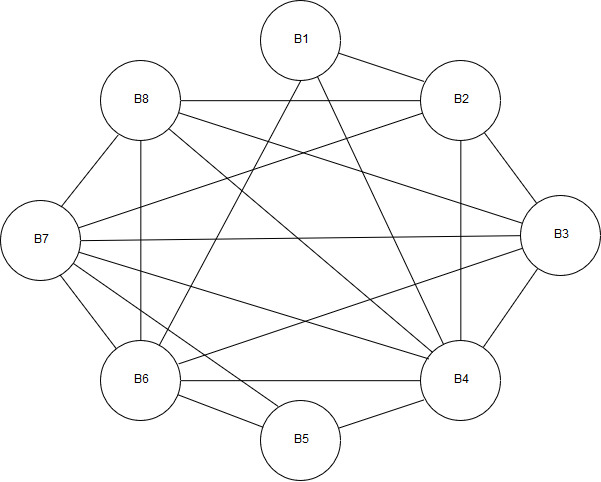
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Problem 1 (Introduction)



The following nodes represent boxes with certain color of wires in them and are connected if they have at least one color the same inside of them.

Problem 3 (Degree of a Vertex)



By Theorem 1.4 in Chartrand [1],

Where is the size of *G*.

Finding the remaining vertices that have not been given,

Where is the order of *G*.

Next find the remaining degrees shared among the 8 vertices,

Dividing the 24 degrees among the 8 vertices,

For the remaining vertices

Problem 5 (Degree of a Vertex)



**Proof**

Graph *G* has the following degrees,

**Odd Case**

Substituting for an odd integer,

Which is an even number for any given which follows Theorem 1.4 [1].

Therefore, there is the following number of vertices with odd degree

Dividing the amount by the total number of vertices

**Even Case**

Substituting for an even integer,

This is not possible by Corollary 1.5 [1], which states

*Every graph has an even number of odd vertices*

Therefore, there is two-thirds of the vertices of *G* that have odd degree in this case.

Problem 7 (Isomorphic Graphs)



1. is defined by

The function is bijective, and all mutually adjacent vertices in are also mutually adjacent in . Therefore,

1. These graphs cannot be isomorphic as they are not of the same order. Therefore, there cannot exist a bijective function such that meaning

Problem 11 (Regular Graphs)



By definition, a regular graph has the following property

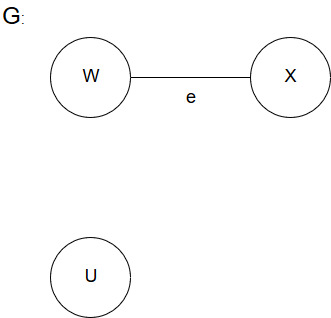
Where refers to the smallest degree of a vertex in , and refers to the largest degree of a vertex in .

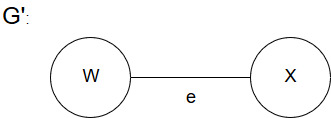
Therefore, a nonregular graph must have the following property,

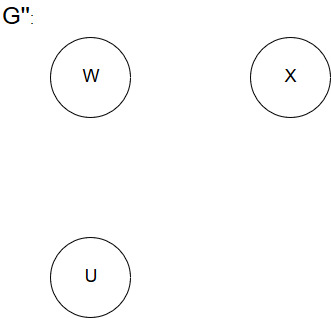
Thus , however based on Corollary 1.5 [1] mentioned in problem 5, the difference must be

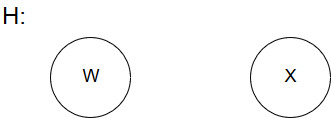
Problem 13 (Regular Graphs)



Graph is nonregular,

Graph deletes node and creates a 1-regular graph,

Graph deletes edge and creates a 0-regular graph,

Graph is deletes both edge and node , and creates a 0-regular graph,

Works cited

“Introduction.” *Graphs & Digraphs*, by Gary Chartrand et al., CRC Press, 2016, pp. 1–13.