

Combinatorics and Graph Theory (MATH 685)

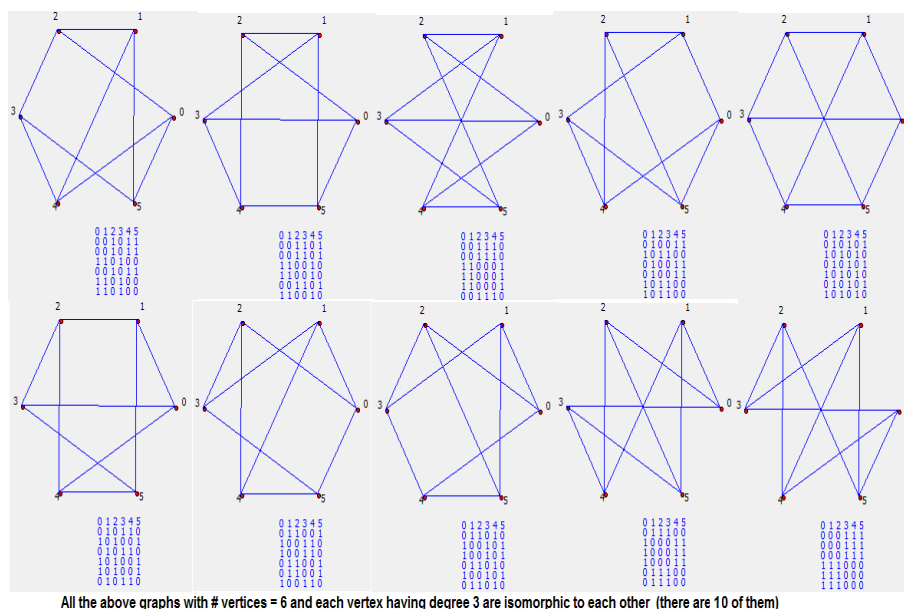
Homework Problems

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Section 1.2 (Problem 12)

There are exactly 2 different isomorphic (undirected) graphs with 6 vertices with each vertex having degree 3 (total number of edges = $\frac{1}{2} \times (6 \times 3) = 9$). The following figures (Figure 1, Figure 2) represent those two different groups - one having 10 graphs, isomorphic to each other, while the other one has 60 isomorphic graphs. The following



All the above graphs with # vertices = 6 and each vertex having degree 3 are isomorphic to each other (there are 10 of them)

Figure 1: All 10 graphs with 6 vertices and 9 edges are isomorphic

simple algorithm is used to generate all isomorphic graphs:

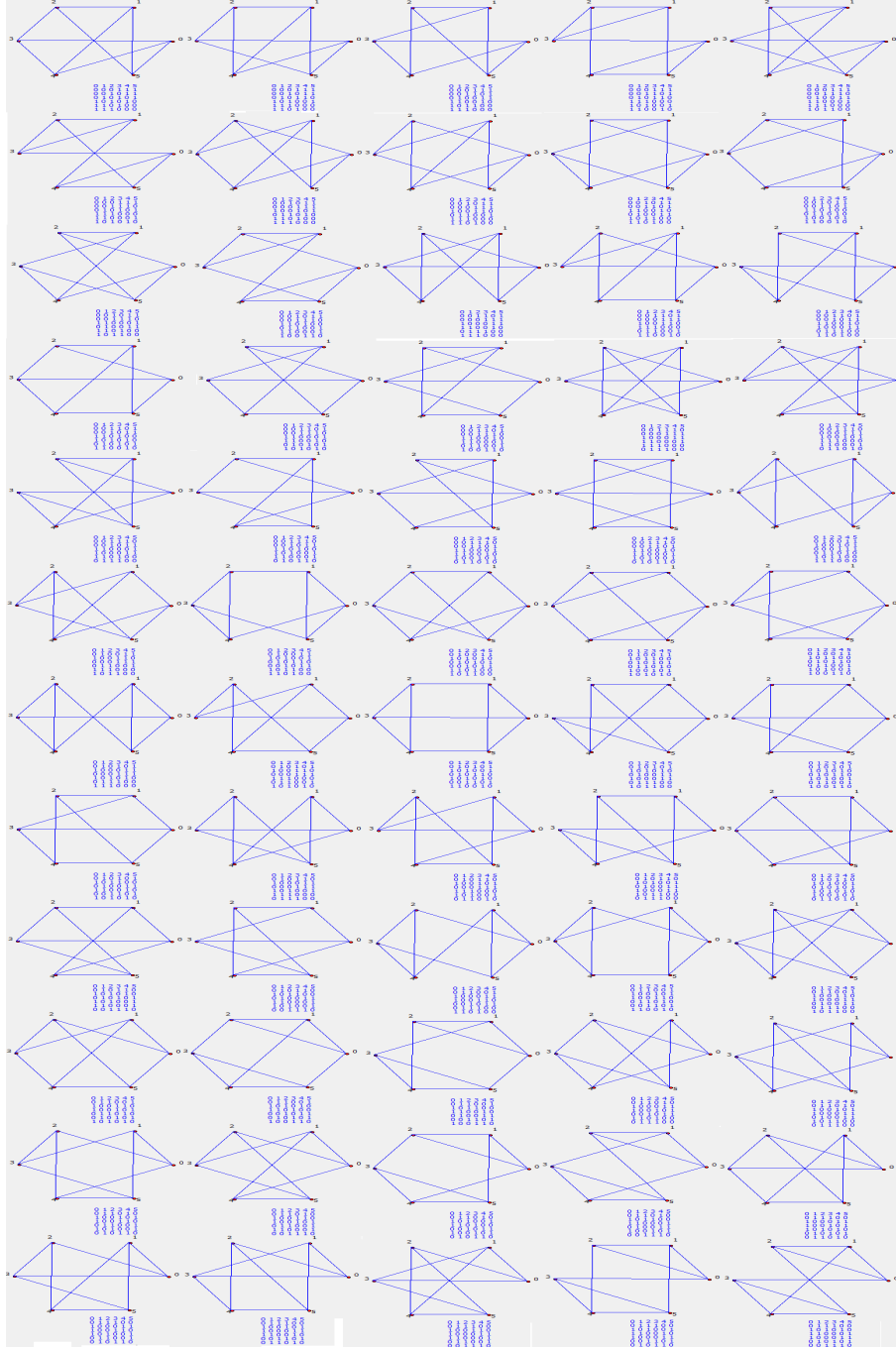


Figure 2: All 60 graphs with 6 vertices and 9 edges are isomorphic

Algorithm 1 GRAPHISOMORPHIC: Generate all isomorphic graphs with 6 vertices and 9 edges

- 1: Generate all possible graphs with 6 vertices and choose the ones with all vertices with degree 3 (total number of edges 9), do the following steps with the graphs chosen.
 - 2: Create a new group and add the first graph to the group.
 - 3: **for** each of the remaining graphs **do**
 - 4: **if** Current graph is isomorphic to the first graph in any of the existing groups **then**
 - 5: Add the graph in the corresponding group.
 - 6: **else**
 - 7: Create a new group and add the graph to the new group.
 - 8: **end if**
 - 9: Proceed to the next graph.
 - 10: **end for**
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