

COMP362 WINTER 2016 ASSIGNMENT 3

Due at 14:30 on March 31st 2016

- 1) An instance of Partial Isomorphism consists of a graph G and a graph H . We are asked to determine if there is a subgraph G' of G such that H is isomorphic to G' . Show that Partial Isomorphism is NP-complete.
- 2) Give an algorithm to determine $C_{\leq}(G)$ in $O(d^{|V|})$ time on graphs of maximum degree $d \geq 2$. Note that G may not be connected.
- 3) Give (and justify) as good an upper bound as you can on (i) the number of isomorphism between two 3-connected planar graphs each with 14 vertices and 33 edges, and (ii) two trees each of maximum degree three.
- 4) We consider the family of graphs G such that (i) $|V(G)|$ is an even perfect square, and for every d in $\{\frac{|V|}{2} - \sqrt{|V|} + 1, \dots, \frac{|V|}{2}\}$ there are $\sqrt{|V|}$ vertices of degree d , and (ii) for every two vertices x and y , there is some d such that the number of neighbours of x of degree d is different from the number of neighbours of y of degree d . Show that there is a canonical labeling algorithm running in $O(|V|+|E|)$ time on these graphs.

Please email your solutions to yuditskyl@gmail.com