

Analysis of Algorithms

Long Questions

1 Introduction to graph theory

1.1 Application example

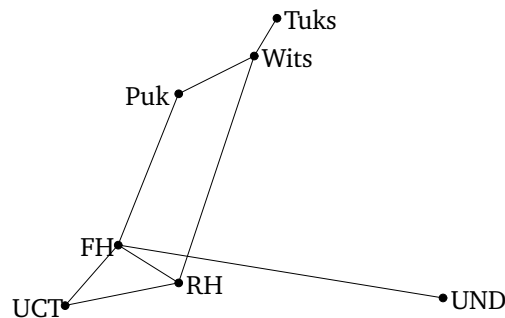


Figure 1: A graph representing a simple computer network

1.2 Paths and Connectedness

1. Can you think of an application where we need to find out whether a graph is connected?
2. What is the difference between a walk and a path?
3. Show that if there is a walk between two vertices that there is a path too.

1.3 Computer representation of graphs

1. Describe the two most common methods of graph representation using graphs.
2. What are their advantages and disadvantages?
3. Show how these methods would be used to represent the graph in Figure 1.

2 Colouring

1. If a graph consists only of one cycle, what is its chromatic number.
2. Consider the graphs in Figure 2 and Figure 3. Apply the approximate graph colouring algorithm to them.

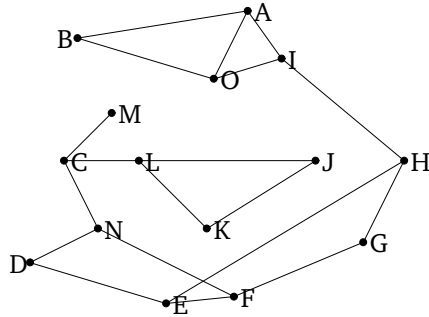


Figure 2: Example for colouring

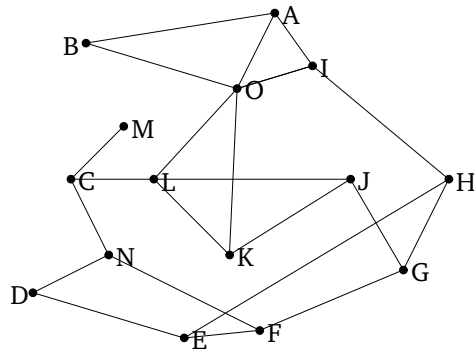


Figure 3: Example 2 for colouring