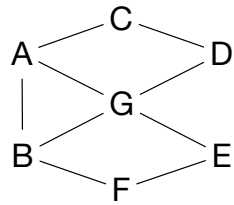
3. (a) Explain the following heuristics, and how they are used in a backtracking search.

- minimum remaining values,
- degree heuristic, and
- least constraining value. [6]

(b) Consider a CSP containing variables $\{A, B, C, D, E, F, G\}$ that must be assigned values from the set $\{red, green, blue\}$. Suppose we have the constraint that certain regions must not be the same colour, as defined by the constraint graph given below. Use the backtracking algorithm and the heuristics from part (a) to find a solution to this problem. Show all the steps carried out by the algorithm.



[6]

(c) Explain how cutset conditioning could be used in the CSP from part (b) to make the search more efficient. State the upper bound on the number of nodes expanded with and without cutset conditioning. [6]

(d) Suppose that you have been tasked with determining the control parameters for an automated flood defence system. These parameters are stored in a vector of length n.

i. Describe how you would use a genetic algorithm to solve this problem, including in your answer an explanation of how crossover and mutation operate in this context. [5]

ii. Would there be any advantage to using A* instead of a genetic algorithm? Explain your reasoning. [2]