2 Artificial Intelligence I (SBH)

(a) Explain, giving a specific example, why *chronological backtracking* might be sub-optimal in solving *Constraint Satisfaction Problems (CSPs)*. [4 marks]

(b) Explain what is meant by *backjumping*. Give **two** ways in which the approach to backjumping taken by *Gaschnig's algorithm* differs from that taken by *graph-based backjumping (GBB)*. [4 marks]

Consider the following incomplete attempt to solve a CSP.
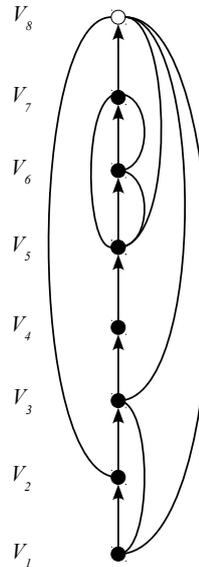
In this diagram, filled nodes are assigned variables, unfilled nodes are currently unassigned, arrows denote the order in which variables are assigned, and arcs denote constraints between variables.

(c) Give a detailed explanation of how in general GBB decides where to make its first backjump. Illustrate your answer using the example above, assuming that it is not possible to make a consistent assignment at V_8. [4 marks]

(d) In the example illustrated, assume the first backjump made is from V_8 as in part (c). We find after the first backjump that the variable we have arrived at has no further consistent assignments. Give a detailed explanation of how GBB decides what to do next, including in your answer a description of the set of *induced ancestors* that are relevant in making the decision. [8 marks]