1. (a) Explain, using examples, how forward and backward chaining control reasoning in rule-based systems. [3]

   (b) i. What is meant by conflict resolution in the context of rule-based systems? [2]

   ii. Describe how and why refractoriness and specificity are useful techniques for conflict resolution. [3]

   (c) Suppose you are deciding what train to catch, and could use your mobile phone to download the current timetable. You are unsure whether you charged your phone, but there is a 40% probability that it is charged. If the phone is charged there is a 70% probability of successfully downloading the timetable. You assign a successful outcome a utility of $+50$ and an unsuccessful outcome a utility of -50. If the phone is not charged the probability of success is 0.1%.

   i. Create a decision tree for this problem. [4]

   ii. Solve the decision tree to determine whether you should try to download the timetable. [6]

   (d) Define the terms causal link and clobbering in the context of partial order plans, and state how to avoid a clobbering conflict. [3]

   (e) Describe the operation of conditional planning in the context of POP. [4]