1 Artificial Intelligence (sbh11)

You are solving a planning problem using the GraphPlan algorithm. The problem has the following actions:

\[
\begin{array}{cccc}
\neg A(S), H(M) & \neg A(B) & \neg H(M), A(B) & \neg H(C), H(M), A(S) \\
a_1(S) & a_1(B) & a_2(M) & a_2(S) \\
A(S) & A(B) & H(M) & H(C), \neg H(M)
\end{array}
\]

The start state is \(\neg H(M), \neg H(C), \neg A(S), \neg A(B)\) and the goal is \(H(C)\).

(a) Draw the state levels \(S_i\) and action levels \(A_i\) of the planning graph up to and including \(S_2\). Do not add any mutexes at this stage. [3 marks]

(b) Explain why it is not possible at this stage to attempt to extract a plan. [1 mark]

(c) What is the smallest \(i\) for which it might make sense to try to extract a plan, starting from \(S_i\)? Explain your answer. [2 marks]

(d) For the value of \(i\) identified in Part (c), draw levels \(S_{i-1}\), \(A_{i-1}\) and \(S_i\) of the planning graph. [4 marks]

(e) On the diagram you have produced for Part (d), mark four mutexes, each of which arises for a different reason. In each case explain what kind of mutex you have included. [6 marks]

(f) Give a general description of how the extraction of a plan from a planning graph can be addressed as a heuristic search problem. [4 marks]

[Note: This version fixes a typesetting mistake that had appeared in the exam.]