Final Exam
ARTIFICIAL INTELLIGENCE

Question 1 (2 marks):
a. Represent the following sentences using predicate logic:
   i. Every bird has wings or can fly.
   ii. Tweety does not have wings and cannot fly. (1 d)
b. Using the refutation-resolution method to prove that Tweety is not a bird. (1 d)

Question 2 (2 marks):
a. Does a Bayesian network provide sufficient information to compute any probability related to the random variables represented by its nodes? Why? (0.5 d)
b. Given the Bayesian network about some events of a car as in Figure 1, compute the probability for the car not starting (i.e., $S = \overline{f}$) given the radio not working (i.e., $R = \overline{f}$). (1.5 d)

![Figure 1](https://fb.com/tailieudientucntt)

Question 3 (2 marks):
Suppose a fuzzy set $A$ defined by the membership function as in Figure 2 ($a \leq b \leq c$). Derive and draw the membership function of the fuzzy set $A/A$ (division) using the notion of $\alpha$-cuts and the interval arithmetic.

![Figure 2](https://fb.com/tailieudientucntt)

Question 4 (2 marks):
a. In the Goal Stack Planning algorithm, when a compound goal is encountered at the top of the stack, all of its unsatisfied sub-goals are pushed to the stack. Explain why retaining the compound goal in the stack is necessary. (0.5 d)
b. Applying Goal Stack Planning, trace the steps followed to make a plan for the block world in Figure 3, showing the stack contents in each step. (1.5 d)

![Figure 3](https://fb.com/tailieudientucntt)

Question 5 (2 marks):
a. For the FIND-S concept learning algorithm, is the outputted hypothesis always consistent with the negative instances of a training dataset? Why? (0.5 d)
b. Applying FIND-S to derive a hypothesis for the Japanese Economy Car concept given by the attribute-classification table as below. (1.5 d)

<table>
<thead>
<tr>
<th>NO.</th>
<th>ORIGIN</th>
<th>MANUFACTURE</th>
<th>COLOR</th>
<th>DECADE</th>
<th>TYPE</th>
<th>JAPANESE ECONOMY CAR</th>
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<tr>
<td>1</td>
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<td>Honda</td>
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<td>1980</td>
<td>Economy</td>
<td>Positive</td>
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<tr>
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<td>Toyota</td>
<td>Green</td>
<td>1970</td>
<td>Sports</td>
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</tr>
<tr>
<td>3</td>
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<td>Toyota</td>
<td>Blue</td>
<td>1990</td>
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<tr>
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<td>Economy</td>
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</tbody>
</table>