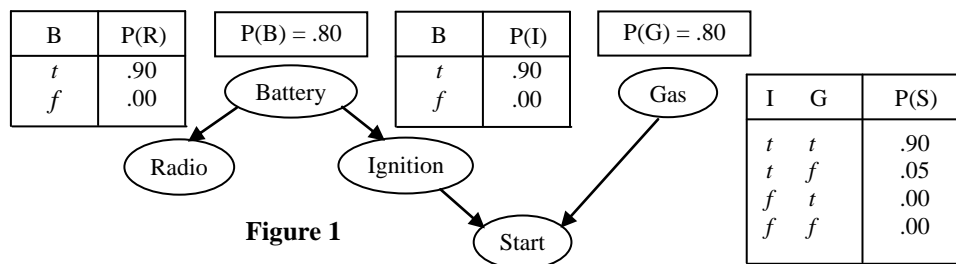# Final Exam
ARTIFICIAL INTELLIGENCE

Questions: 5 – Total marks: 10 – Time: 110 minutes – Open book

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 đ)
b. Using the refutation-resolution method to prove that Tweety is not a bird. (1 đ)
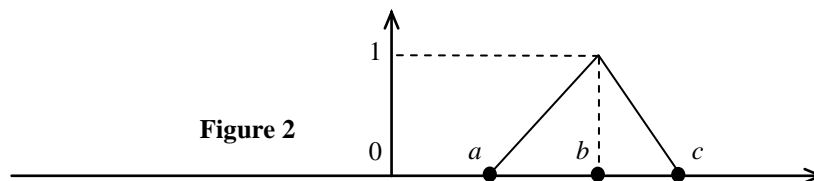
Question 2 (2 marks):
a. Does a Bayesian network provide sufficient information to compute any probability related to the random variables represented by its nodes? Why? (0.5 đ)
b. Given the Bayesian network about some events of a car as in Figure 1, compute the probability for the car not starting (i.e., $S = f$) given the radio not working (i.e., $R = f$). (1.5 đ)
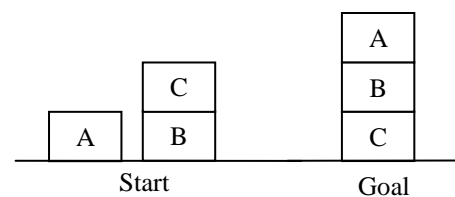
B	P(R)
t	.90
f	.00

P(B) = .80

B	P(I)
t	.90
f	.00

P(G) = .80

I	G	P(S)
t	t	.90
t	f	.05
f	t	.00
f	f	.00

Figure 1

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 α−cuts and the interval arithmetic.

Figure 2

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 đ)
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 đ)

Figure 3

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 đ)
b. Applying FIND-S to derive a hypothesis for the Japanese Economy Car concept given by the attribute-classification table as below. (1.5 đ)

NO.	ORIGIN	MANUFACTURE	COLOR	DECADE	TYPE	JAPANESE ECONOMY CAR
1	Japan	Honda	Blue	1980	Economy	Positive
2	Japan	Toyota	Green	1970	Sports	Negative
3	Japan	Toyota	Blue	1990	Economy	Positive
4	USA	Chrysler	Red	1980	Economy	Negative
5	Japan	Honda	White	1980	Economy	Positive
6	Japan	Toyota	Green	1980	Economy	Positive
7	Japan	Honda	Red	1990	Economy	Negative

-------- End --------