Final Exam 2013

ARTIFICIAL INTELLIGENCE

Questions: 4 – Total marks: 10 – Time: 120 minutes – Open book

Question 1 (3 marks): Consider the following statements for the AI course at HCMUT:

- Every student obtains good final results if performing well in both of the tutorials and the assignments.
- If a student attends all classes of the course, then he/she performs well in the tutorials.
- Every student does the assignments well if he/she has sufficient programming skills and attends all classes of the course.
- John does not have good final results.
- Mary has sufficient programming skills and attends all classes of the course.

(a) Represent these statements using predicate logic. (1 m)

(b) Use the refutation-resolution method to:

- Find out who obtains good final results. (1 m)
- Prove that John does not have sufficient programming skills or is absent from some classes. (1 m)

Question 2 (4 marks): For the AI course at HCMUT, the final course result of a student depends on whether or not he/she performs well in the tutorials and the assignments. Statistics shows that 90% of those students who perform well in both of the tutorials and the assignments obtain good final results, while the percentage is only 20% for those who perform well in only the tutorials or the assignments, and it drops to 5% for those who badly perform in both of the activities. Also, a student cannot do well the assignments if he/she lacks of programming skills, and the chance is 90% or 50% otherwise depending on whether he/she attends all classes of the course or not. Meanwhile, if a student attends all classes of the course, then it is likely to the degree of 0.9 that he/she performs well in the tutorials, and that degree drops to 0.3 otherwise. It is recorded that 85% of students attend all classes of the course and 95% of them have sufficient programming skills.

(a) Construct a Bayesian network from these statistical data. (1 m)

(b) How likely does a student do well the assignments? (1 m)

(c) What is the probability that a student performs well in the tutorials given his/her good final results? (1 m)

(d) Prove that having sufficient programming skills and doing well in the tutorials are independent from each other. (1 m)

Question 3 (1 mark): Propose a voting model of 10 voters for the fuzzy number "about 5" and derive the corresponding fuzzy set. Assume that the domain of the fuzzy set is the discrete value set {0, 1, 2, ..., 10}. Then draw its linear diagram using interpolation between data points.

Question 4 (2 marks): As shown in the table below, the four factors that determine the vehicle type a person uses for transportation are: gender, number of cars own, transportation cost with chosen vehicle, and income. Assume the possible attribute values are all given in the table.

No.	ATTRIBUTES				CLASSIFICATION
	Gender	Number of Cars Own	Transportation Cost	Income	Transportation Means
1	Male	0	Cheap	Low	Bicycle
2	Male	1	Cheap	Average	Bicycle
3	Female	1	Expensive	High	Car
4	Male	2	Expensive	Average	Car
5	Female	2	Expensive	High	Car
6	Male	0	Normal	Average	Motorbike
7	Female	1	Normal	Average	Motorbike

Use the following algorithms to learn the concept "Car as transportation means":

(a) FIND-S. (1 m)

(b) Candidate-Elimination. Classify instance <Female, 0, Normal, Average> according to the learned hypotheses. (1 m)

**** End ****