Paper Code	Examiner	Department	Ext
CSE 202		Computer Science & Software Engineering	

Xi'an Jiaotong-Liverpool University
西交利物浦大学

2017/18 Semester 2 - Resit Exam

Bachelor Degree - Year 3

Introduction to Artificial Intelligence

Time Allowed : 2 Hours

Instructions to Candidates

1. Total marks available are 100. This exam will count for 80% in the final assessment.
2. Answer all questions.
3. The number in the column on the right indicates marks available for each section.
4. Answers should be written in the answer booklet(s) provided.
5. All the answers must be in English.

Question 2 [30 marks]

Answer the following SIX questions. Each question is worth 5 marks.

1. What is Turing Test? Describe the Turing test in words and a picture.

2. Consider the task of designing a medical diagnosis system, give the PEAS description of the "task environment".

3. What is the main purpose of Expert Systems?

4. Forward Chaining and Backward Chaining are two inference methods for rules, each is commonly used for different problem types. Describe a problem you would use each for.

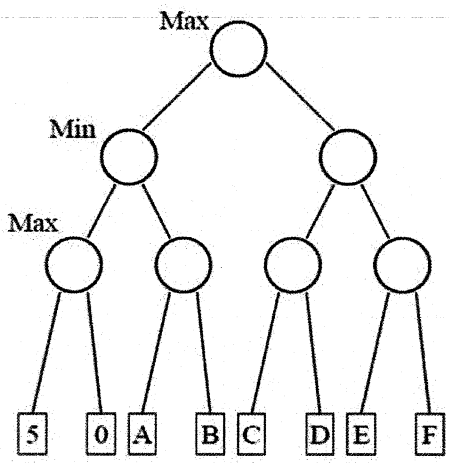
5. Describe at least three advantages that expert systems offer organisations that would otherwise have to employ human experts.

6. Write a Prolog rule `reverselist(X,Y)` such that given list X, Y is the result of reversing X. Use `reverselist(X,Y)` in queries.

Question 3 [15 marks]

Questions on Game Playing. There are $5 \times 3 = 15$ marks in total.

Consider the game tree picture below where A-F represent some real values. Assume the nodes are explored from left to right and standard alpha beta pruning is used.



(1) Give a value of A such that B is pruned.

(2) Give a value of A such that B is NOT pruned.

(3) True or False: There are SOME values of A and B such that the subtree containing C and D is pruned.

(4) Assume that B=5 and A=5, give a value of C and D such that the subtree containing E and F is pruned.

(5) If you are allowed to assign A-F arbitrarily, what is the MAXIMUM number of leaves that can be pruned?

Question 4 [20 marks]

There are TWO questions on propositional logic. Each is worth 10 marks.

1. Resolution requires sentences to be in conjunctive normal form (CNF). Convert the following sentences into CNF.

$$\neg T \vee Q \Rightarrow (S \wedge R)$$

2. Consider a propositional language with three propositional CONSTANTS - snake (s), colorful (c), and poisonous (p). Using these propositional constants, encode the following English sentences as Propositional Logic sentences (e.g. "All colorful snakes are poisonous" is encoded by $s \wedge c \Rightarrow p$).

   (1) A snake is poisonous only if it is colorful.

   (2) A snake is not poisonous unless it is colorful.

   (3) No colorful snake is poisonous.

Question 5 [20 marks]

Answer the following TWO questions on Predicate Logic. Each question is worth 10 marks.

(1) Translate the following English sentences into predicate logic where the universe is the set of people. Assume the allowable predicates:
$S(x)$: x is a student.
$F(x, y)$: x and y are friends.
$O(x, y)$: x is older than y.

a) Every student has a friend who is also a student.

b) There is someone who is older than all of his/her friends.

(2) Write a predicate logic statement equivalent to the negation of each of the statements above that DOES NOT USE negation anywhere except immediately in front of the predicate symbols S, F, and O.

End of paper