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

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

2017/18 Semester 2 - Final 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. Do you think Turing Test is still a valid test of Artificial Intelligence? In many people's opinion, the Turing Test is not very helpful for designing intelligent systems, why?

2. Consider the task of designing an automated taxi driver. Give the PEAS description of the "task environment".

3. Explain the important components of a rule-based system.

4. Discuss with examples the main differences between forward chaining and backward chaining.

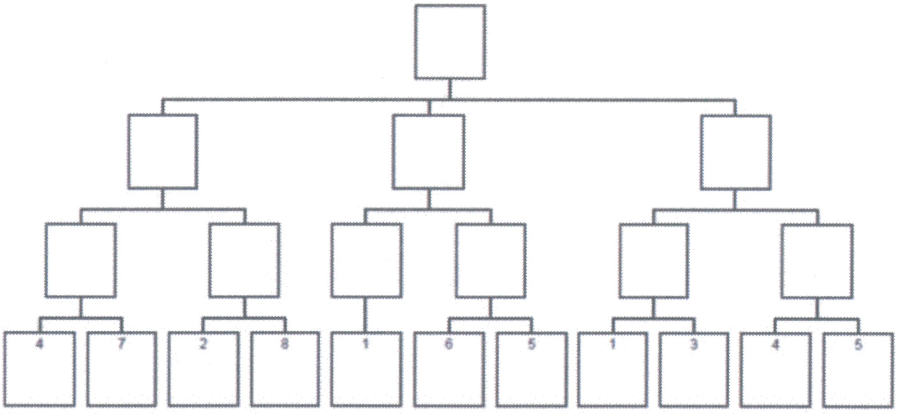
5. Describe at least three drawbacks of the rule-based Expert Systems.

6. Write a Prolog rule `deleteall(X,Y,Z)` such that Z is the result from deleting all occurrences of Y in the list X. Use `deleteall(X,Y,Z)` in queries.

Question 3 [15 marks]

Questions on Game Playing. There are 15 marks in total. Each question is worth 5 marks.

Consider the search in a two-player game as illustrated in the following chart.



The chart above shows part of the search space for a two-player game. The values given in the lowest layer are heuristic evaluations of those states. Higher is better for you. You go first.

(1) Using minimax (no pruning), determine the minimax score for all of the states shown, and write them into the empty boxes.

(2) Draw a box around your first move.

(3) Circle all the nodes that would be evaluated using alpha-beta pruning.

Draw a line through any branches that would be pruned.

Question 4 [20 marks]

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

1. State whether each of the following propositional logic sentences is satisfiable (possibly true or false), unsatisfiable (always false), or valid (always true):

   a.
   $$Q \wedge True$$

   b.
   $$(S \Rightarrow Q) \Rightarrow \neg S$$

   c.
   $$(P \Rightarrow S) \Rightarrow (\neg P \vee S)$$

   d.
   $$P \vee Q \vee R \vee S \vee False$$

2. Prove the following logical equivalence
   $$\neg q \vee [\neg(p \vee \neg p) \wedge r] \Rightarrow s \equiv s \vee q$$

Question 5 [20 marks]

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

(1) Using the given translation key:
$B(x, y)$: x bores y.
$U(x, y)$: x understands y.
$S(x, y)$: x is a student of y.
$P(x)$: x is a professor.
$L(x, y)$: x listens to y.

give translations of the sentences below:

(a) Every professor bores some of his or her students.

(b) Any professor bored by everything bores all his or her students.

(c) Some professors bore all professors.

(d) Professors don't understand the students they bore, and students don't listen to the professors they are bored by.

(2) Write first-order logic sentences to represent the following statements. Use the unitary predicates {Student, TShirt, Professor, GoodGuy, White } and the binary predicated { Wears, EmbroideredOn, HasFavorite, IsFavorite }.

(a) Some students wear a T-shirt with "XJTLU" on it.

(b) Every student has a favorite professor.

(c) Good guys wear white.

End of paper