

# 國立交通大學試題紙

科目：人工智慧 (A)

日期：98 年 7 月 22 日 第 1 頁 共 1 頁

請 “✓” 明    ✓不可看書    可看書

\* 請將答案依題號順序寫入答案卷

答題時字跡需工整，否則不予計分。Write your answers legibly; otherwise you will get zero score.

1. (5pts) Will the same attribute be tested twice along a path in a decision tree produced by a decision-tree learning algorithm? Why or why not?
2. (8pts) Suppose the domain experts already have the real decision tree as the answer to a specific application. Now given a training dataset whose size reaches infinity, will a decision-tree learner generate a tree that is logically consistent with the real one? Will this decision tree generated be syntactically the same as the real one? Why or why not?
3. You are given a neural net with linear activation functions, as defined below.  
 $F(x) = cx + d$ , where  $x$  is a unit,  $c$  is a coefficient constant, and  $d$  is the threshold.  
Now assume this network has one hidden layer. Denote the weights as  $W$ , and the inputs as  $I$  (where  $W$  and  $I$  are vectors).
  - a. (12pts) Write down the equation for an output unit, using  $W$  and  $I$ .
  - b. (15pts) Show there exists a network without hidden layers that can produce the same output.
4. (10pts) Briefly describe the differences in decision boundary between neural nets and decision trees. You can illustrate your ideas by figures.

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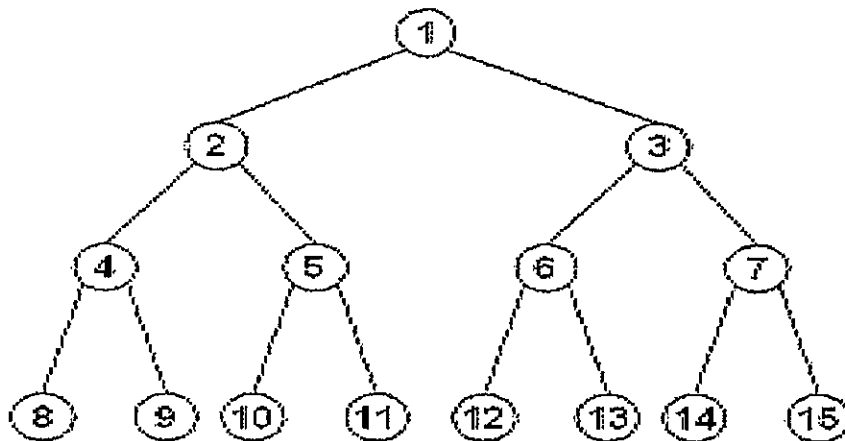
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1. Following figure is the portion of the state space for state  $n$  and its successors  $2n$  and  $2n+1$ .



- a. (5 points) Would bidirectional search be appropriate for this problem? if so, describe in detail how it would work by listing the search step.
- b. (5 points) Does the answer to (a) suggest a reformulation of the problem that would allow you to solve the problem of getting from state 1 to a given goal state with almost no search?
- c. (8 points) Discuss the cases where bidirectional search is optimal and where it is complete.
2. (7 points) What complication regarding completeness can be caused when augmenting A\* to include the provision for deleting revisited states?

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3. (8 points) Represent the following sentences in FOL

- a. only one student took AI qualify in July 2009
- b. every student who takes AI qualify passes it.

4. Given the following sentences:

If a course has a project, no students who take this course will be happy.

If a course is easy, some students who take this course will be happy.

and the following predicates:

hasProject(x): course x has a project

isHappy(x): student x is happy

isEasy(x): course x is easy

take(x, y): student x takes course y

(a) (4 points) Translate these sentences into FOL sentences.

(b) (4 points) Convert FOL sentences into CNF.

(c) (9 points) Use resolution to prove that any course without a project is an easy course.