BITS PILANI, DUBAI CAMPUS
Dubai International Academic City, Dubai
First Semester 2011-12
Comprehensive Exam(Closed Book)

No. of Questions: 8	
No. of Pages	: 2

Course Number & Title : EA C461 – Artificial Intelligence **Year : IV year**
Duration : 3 Hours **Time : 12.30PM – 3.30PM** **Date: 4- 1-2012**
Weightage : 40% **Marks : 80**

Note : Answer All Questions

1.a. Imagine you only ever do four things at the weekend: go shopping, watch a movie, play tennis or just stay in. What you do depends on three things: the weather (windy, rainy or sunny); how much money you have (rich or poor) and whether your parents are visiting. You say to your yourself: if my parents are visiting, we'll go to the cinema. If they're not visiting and it's sunny, then I'll play tennis, but if it's windy, and I'm rich, then I'll go shopping. If they're not visiting, it's windy and I'm poor, then I will go to the cinema. If they're not visiting and it's rainy, then I'll stay in. Represent all these requirements using a decision tree. 5M

b. Explain the following terms with respect to decision trees a. Happy graphs b. Overfitting 2 .5X 2 = 5M

2. Explain the two techniques of learning i) current best hypothesis search algorithm ii) Least commitment search with clear examples and algorithms. 5 + 5 M

3. a. With the help of diagrams explain the working of a perceptron and a multilayer neural network. With the help of an algorithm clearly explain the back propagation algorithm for a multilayer network. 5 + 5 M

4. a. Construct a Bayesian network to represent the given features of a car's electrical system and engine. The condition of the battery determines the working of the radio and the ignition of the car. A car starts depending on the ignition and availability of fuel. The car moves if it starts.
b. Add conditions of Icy weather and Starter Motor to the above Bayesian network and represent the same.
c. Represent part a. as a Relational Probability Model. 4 + 3 + 3M

5.a. Prove that the following pairs of sentences are equivalent.

1. $p \Rightarrow q$ and $\neg p \vee q$
2. $p \Rightarrow q$ and $\neg q \Rightarrow \neg p$

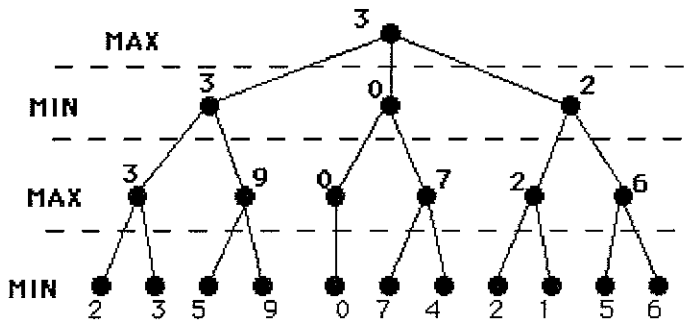
b. Does the sentence
``I passed this course and gained distinction"
entail the sentence
``I passed this course or gained distinction"?
c. Is the sentence
``If I pass this course then I gain distinction"
equivalent to the sentence
``I pass this course and do not gain distinction"? 4 + 3 + 3 M

6. Consider the following information:

- Animals can outrun any animal that they eat
- Carnivores eat other animals
- Outrunning is transitive
- Lions eat zebras
- Zebras can outrun dogs
- Dogs are carnivores

Represent the above statements using predicate logic and Use resolution to find 2 animals that lions can outrun. 5 + 5 M

7. a. Why is the concept of search important in game playing ?
   b. What is the importance of the alpha and beta values in two player game search trees.
   c. With respect to the below given tree , show how alpha beta pruning would work for this tree. 2 + 2 + 6M



Minimax of a hypothetical search space. Leaf nodes show heuristic values.

8. Draw a tree and indicate how the Depth First Search and breadth first search algorithms work for this sample tree, write the algorithm for both these techniques and explain how these techniques work and compare the advantages and disadvantages of both these techniques. 5 + 5 M

**********ALL THE BEST**********

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Test – 2(Open Book)

No. of Questions: 3
No. of Pages : 1

Course Number & Title : EA C461 – Artificial Intelligence **Weightage : 20%**

Duration : 50 minutes **Date: 20- 11-2011** **Year : IV year** **Marks : 20**

Note : Answer All Questions

1.a. Represent each of the following sentences in predicate logic

i. Tony, Shi-Kuo and Ellen belong to the Hoofers Club.
ii. Every member of the Hoofers Club is either a skier or a mountain climber or both.
iii. No mountain climber likes rain, and all skiers like snow.
iv. Ellen dislikes whatever Tony likes and likes whatever Tony dislikes.
v. Tony likes rain and snow.

b. Convert the following sentences to the clause form and answer the query : Is there a member of the Hoofers Club who is a mountain climber but not a skier? (5+2+3M)

2. a. An insurance company runs three different offices A, B, C. 30% of the employees work in Office A, 20% in Office B and 50%in office C. 10% of the staff in office A are managers, 20% of the staff in office B are managers and 5% of office C are managers.

i) What is the total proportion of managers in the company ?

ii) If a member of the staff chosen at random turns out to be a manager , what is the probability that she works in office A ?

b. If a sample space can be partitioned into k mutually exclusive and exhaustive events A1 A2 A3 ….Ak i.e. S = A1 U A2 U A3…..UAk

Then prove that for any event E

$P(E) = P(A1)P(E/A1) + P(A2)P(E/A2)+\ldots\ldots\ldots\ldots P(Ak)P(E/AK)$ (3 + 3M)

3.a. Represent the following information using a Semantic Net.

A mammal is a vertebrate and also an animal, cats and bears are both examples of mammals which have fur covering their body. A whale is an example of a mammal which lives in water. A fish is also an animal.

b. What is the benefit of a semantic representation explain clearly with this example. (3 + 1M)

********** ALL THE BEST**********

BITS PILANI, DUBAI CAMPUS
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First Semester 2011-12
Test – 1(Closed Book)

No. of Questions: 6
No. of Pages : 1

Course Number & Title : EA C461 – Artificial Intelligence **Weightage : 25%**

Duration : 50 minutes **Date: 2- 10-2011** **Year : IV year** **Marks : 25**

Note : Answer All Questions

1. Define Artificial Intelligence and give three Applications of Artificial Intelligence 2 marks
2. What are heuristics? How are they useful in search problems? How do you decide on an appropriate heuristic for a given problem? 1+1+2M
3. Explain the working of the A* algorithm 4 marks
4. Discuss how the problem of tic-tac-toe would be solved if solved as a DFS and with breadth first search. Which technique would be better in terms of memory and space requirements? 2+1M
5. Consider a travelling salesman problem, find a tour for the given cities such that each city is visited only once. Use the concepts of Genetic algorithms to solve this problem. The cities are represented in the given order.

1. London 2. Venice 3. Norway 4. Singapore 5. Bejing
6. Phoenix 7. Delhi 8. Tokya

CityList1 (3 5 7 2 1 6 4 8)
CityList2 (2 5 7 6 8 1 3 4) 4M
Clearly indicate how the search would proceed in each stage of Genetic algorithms.

6. Consider a game of 2X2 tic-tac-toe where each player has the additional option of passing (i.e. marking no square). Assume X goes first followed by O.
   a. Draw the full game tree to a depth of 2. You need not show the nodes that are rotations or reflections of siblings already shown.
   b. Suppose the evaluation function is the number of Xs minus the number of O, mark the values of all leaves and internal nodes.
   c. Circle any node that would not be evaluated by alpha-beta during a left to right exploration of the tree.
   d. If we have to solve the problem, explain why alpha beta with an appropriate move ordering is much better than minimax. 8M

**********ALL THE BEST**********

BITS PILANI, DUBAI CAMPUS
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First Semester 2011-12
Quiz(Closed Book)

Course Number & Title : EA C461 – Artificial Intelligence **Weightage : 8%**

Duration : 20 minutes **Date: 17- 10-2011** **Year : IV year** **Marks : 8**

Name: _____ **ID:** _____

SET A

1. Represent the following statement in Predicate Logic 3 X 1 = 3M

a. Every cat loves it mother or father.

b. Every dog who loves one of its brothers is happy.

c. No dog bites a child of its owner

2. Proove the logical equivalence using truth table ( ) = ( ) 2M

3. State whether the given statement is true or false and justify your answer. 1.5 X 2 = 3M

a.

b.