4-1/CSE

Code No. : 3154

FACULTY OF ENGINEERING
B.E. 4/4 (CSE) I Semester (Main) Examination, December 2010
ARTIFICIAL INTELLIGENCE

Time : 3 Hours] [Max. Marks : 75

*Note : 1) Answer **all** questions from Part **A**.*
*2) Answer **any five** from Part **B**.*

PART – A **(25 Marks)**

1. How many nodes are expanded (in the worst case) by breadth first search technique when searching a tree with branching factor b to find a goal at a depth of d ? 3
2. Define alpha in alpha-beta search algorithm. 2
3. Represent the following sentence in first order predicate logic :
   All dogs are mortal. 3
4. Give two advantages of expert systems. 2
5. Differentiate between conditional probability and joint probability. 3
6. What is the ramification problem ? 2
7. Define entropy. 3
8. Give an example of a linearly separable function. 2
9. Give an example for a noun phrase and a verb phrase. Tag each word with its part of speech. 3
10. Give an example for a bigram and a trigram. 2

PART – B **(5×10=50 Marks)**

1. We are given a sliding-tile puzzle with three tiles and a blank and are given a problem with the following initial and final states where a "0" represents a blank spot. Assume that we always try moving the blank first right,then left then up and then down.

Initial

0	1
3	2

Goa

1	2
0	3

   a) How many possible states are there, either reachable or unreachable, from the given start state. 4
   b) If we treated the search space as a tree, what would the result of a breadth-first search be ? Of a depth-first search? 6

2. Given the following English statements : 10
   a) No software is guaranteed
   b) All programs are software
   Infer the following using resolution refutation.
   c) No programs are guaranteed.
3. We want to design a troubleshooting advisor for PCs. Let CF be a Boolean random variable representing whether the Computer Fails (CF = true) or not. Assume there are two possible causes of failure : Electricity-failure and Malfunction-of-the-Computer, represented using the Boolean random variables EF and MC, respectively.
   Let P(EF) = 0.1, P(MC) = 0.2, P(CF | ~ EF, ~MC) = 0.0, P(CF| ~ EF, MC) = 0.5, P(CF | EF, ~MC) = 1.0, and P(CF | EF, MC) = 1.0.
   a) Draw the Bayesian Network (with CPTs) for this problem. 2
   b) Compute P(MC | EF) 2
   c) Compute P(CF, ~EF, MC) 3
   d) Compute P(EF | CF) 3
4. a) Consider a perceptron with 3 inputs and one output unit that uses a linear threshold activation function with threshold 0.7,, and initial weights W1 = 0.2, W2 = 0.7, W3 = 0.9.
      i) What is the output (output = 1 if it exceeds threshold, otherwise 0) of the perceptron given the inputs I1 = 1, I2 = 0, I3 = 1 ? 1
      ii) What are the weights' values after applying the Perceptron Learning Rule with the above input and desired output 0 (learning rate $(\eta) = 0.2$) ? 3
   b) What is a multilayer feed forward network ? Explain. 6
5. a) What are the different ambiguities in natural language processing? Explain with the help of examples. 5
   b) What is the language model in speech processing ? Explain. 5
6. a) Explain the necessity of ADD, DELETE and PRECONDITION lists in STRIPS. 5
   b) With the help of a block diagram explain the various components of an expert system. 5
7. Write short notes on : 10
   a) A* algorithm b) Decision trees