7E 7043

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B.Tech. VII Semester (Main/Back) Examination, Dec. - 2015

Electrical & Electronics Engineering

7EX3A Artificial Intelligence Techniques

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. a) Define the terms-natural intelligence and artificial intelligence. How do you differentiate between the two? **(6)**

   b) Define and differentiate between weak and strong AI. **(5)**

   c) Write down the foundation of AI **(5)**

OR

1. a) Explain in short the working of DENDRAL and MYCIN **(8)**

   b) Explain the structure of the brain and its organization. **(8)**

Unit - II

2. a) Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people (one for rowing). Find a way to get everyone to the other side, without ever leaving a group of missionaries in oneplace outnumbered by the cannibals in that place (the cannibals eat the missionaries then).

   i) Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space. **(6)**

   ii) Implement and solve the problem optimally using an appropriate search algorithm. Is it a good idea to check for repeated states? **(6)**

iii) Why do you think people have a hard time solving this puzzle, given that the state space is so simple? **(4)**

OR

2. a) Write four properties a good system should possess for the knowledge representation in a particular domain. **(5)**

   b) What is the difference between knowledge representation and knowledge acquisition? **(5)**

   c) Differentiate between simple hill climbing and steepest ascent hill climbing algorithms. **(6)**

Unit - III

3. a) Explain why a single-layer perceptron cannot solve the XOR problem. Use an X_1 vs. X_2 plot to show that a straight line cannot separate the XNOR states. List the several aspects to keep in mind when selecting an appropriate neural network structure. **(10)**

   b) Explain with the help of a suitable example how Perceptron can be trained using the delta rule. **(6)**

OR

3. a) Derive the weight update equation for discrete Perceptron and write its summary algorithm. **(8)**

   b) Explain with suitable examples, why neural networks can handle massive amount of input/output data more efficiently than conventional computers. **(8)**

Unit - IV

4. a) What are different types of learning schemes used in training of artificial neural networks? Explain each of them clearly. **(10)**

   b) Explain the following terms with respect to Neural networks :

   i) Stability

   ii) Plasticity

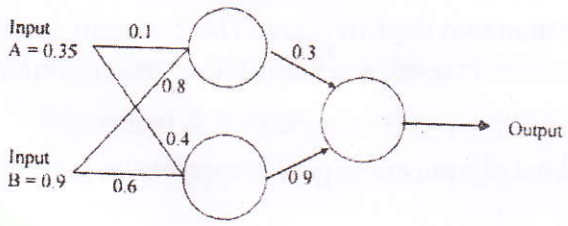
   iii) Learning

   iv) Architecture **(6)**

OR

4. a) Explain the limitations of backpropagation learning. Also explain the scope to overcome these limitations. **(8)**

b) Consider the simple network below : **(8)**



Assume that the neurons have a sigmoid activation function and

i) Perform a forward pass on the network.

ii) Perform a reverse pass(training)once(target = 0.5).

iii) Perform a further forward pass and comment on the result.

Unit - V

5. a) Show that when two fuzzy vectors are identical, that is **a=b**, the inner product $\mathbf{a.b^T}$ reaches a maximum while the outer product $a \oplus b^T$ reaches a minimum. **(10)**

a) Consider the problem of finding the shortest route through several cities, such that each city is visited only once and in the end return to the starting city(the travelling salesman problem).Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between london and paris is represented by a single gene 'LP'. Let also assume that the direction in which we travel is not important, so that LP=PL.

i) How many genes will be used in a chromosome of each individual if the number of cities is 10? **(2)**

ii) How many genes will be in the alphabet of the algorithm? **(4)**

OR

5. a) Using your own intuition, develop fuzzy membership functions on the real line for the fuzzy number "approximately 2 to approximately 8", Using the following function shapes :

i) Symmetric triangles

ii) Trapezoids

iii) Gaussian functions **(8)**

b) A budget airline company operates 3 plains and employs 5 cabin crews. Only one crew can operate on any plain on a single day, and each crew cannot work for more than two days in a row. The company uses all planes everyday. A genetic algorithm is used to work out the best combination of crews on any particular day.

i) Suggest what chromosome could represent an individual in this algorithm? **(1)**

ii) Suggest what could be the alphabet of this algorithm? What is its size? **(1)**

iii) Suggest a fitness function for this problem. **(2)**

iv) How many solutions are in this problem? Is it necessary to use Genetic algorithms for solving it? What if the company operated more plains and employed more crews? **(4)**
