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# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## February / March 2023 Semester End Main Examinations

**Programme: B.E.** **Semester: VII**
**Branch: Institutional Elective** **Duration: 3 hrs.**
**Course Code: 20IS7OEAIM** **Max Marks: 100**
**Course: Artificial Intelligence and Machine Learning** **Date: 22.02.2023**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.



### UNIT - I

1 a) Define Artificial Intelligence. With the help of a schematic diagram, briefly explain how agents interact with environments through sensors and actuators. **06**

b) Give the PEAS description for "Automated Taxi" agent. **04**

c) Define the characteristics of uninformed search strategies. Design an algorithm for Breadth-first search as general graph-search algorithm and comment on time and space complexity for the same. **10**

### UNIT - II

2 a) Write the greedy best-first search algorithm. Illustrate its working with an example. **10**

b) Explain how a constraint satisfaction problem can be applied to a cryptarithmetic problem. **10**

**OR**

3 a) Write the AO* search algorithm. Illustrate its working with an example. **10**

b) Illustrate the working of A* search algorithm with an example. **10**

### UNIT - III

4 a) Define well-posed learning problem. Explain with any two examples. **10**

b) For the below training examples, apply candidate elimination algorithm to show the specific and general boundaries of the version space. **10**

| Size | colour | shape | Target Concept |
|---|---|---|---|
| Big | Red | triangle | Negative |
| Small | Red | triangle | Negative |
| Small | Red | Circle | Positive |
| Big | Blue | Circle | Negative |
| Small | Blue | circle | Positive |

## UNIT - IV

5 a) For the below given dataset, apply ID3 algorithm. Justify your answer by constructing a decision tree **12**

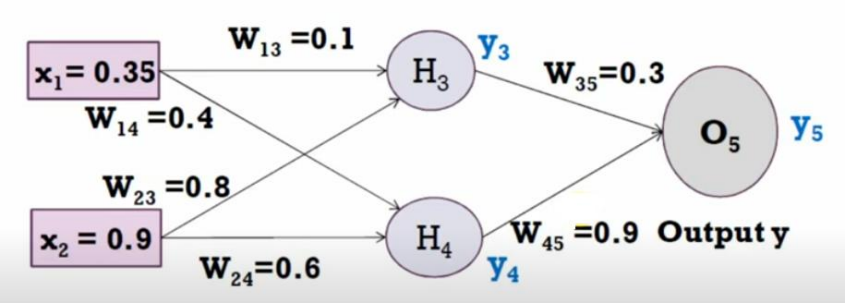
| Sl. No. | Age | Income | Student | Credit rating | Buys computer |
|---|---|---|---|---|---|
| 1. | <=30 | High | No | Fair | No |
| 2. | <=30 | High | No | Excellent | No |
| 3. | 31 to 40 | High | No | Fair | Yes |
| 4. | >40 | Medium | No | Fair | Yes |
| 5. | >40 | Low | Yes | Fair | Yes |
| 6. | >40 | Low | Yes | Excellent | No |
| 7. | 31 to 40 | Low | Yes | Excellent | Yes |
| 8. | <=30 | Medium | No | Fair | No |
| 9. | <=30 | Low | Yes | Fair | Yes |
| 10. | >40 | Medium | Yes | Fair | Yes |
| 11. | <=30 | Medium | Yes | Excellent | Yes |
| 12. | 31 to 40 | Medium | No | Excellent | Yes |
| 13. | 31 to 40 | High | Yes | Fair | Yes |
| 14. | >40 | Medium | No | Excellent | No |

b) Analyze the appropriate problems for Decision Tree Learning method. **08**

## UNIT - V

6 a) ANN learning is well-suited to problems in which the training data corresponds to noisy, complex sensor data, such as inputs from cameras and microphones. Analyze appropriate problems for neural network learning. **10**

b) Assume that neurons have a sigmoid activation function. Perform forward pass and backward pass on the network. Assume that the actual output of Y is 0.5 and learning rate is 1. **10**




**OR**

7 a) Use perceptron learning rule to train the network, the set of input training vector are as follows $X_1$=[1,-2,0,1], $X_2$=[0,1.5,-0.5,-1], initial weight vector $W_1$ is [1,-1,0,0,5]. The desired response is $D_1$=-1 and $D_2$=-1. Calculate the weights after one complete cycle. **10**

b) Consider a multilayer feed forward neural network. Enumerate and explain the steps in backpropagation algorithm used to train a neural network. **10**

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