# P.E.S. College of Engineering, Mandya - 571 401

*(An Autonomous Institution affiliated to VTU, Belagavi)*

**Second Semester, M.Tech. - Computer Science and Engineering (MCSE)**
**Semester End Examination; May / June - 2018**
**Machine Learning Techniques**

*Time: 3 hrs*                                                          *Max. Marks: 100*

*Note*: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

## UNIT - I

1 a. Define Machine Learning. Explain well-posed learning problems with atleast three examples by mentioning the required features.　7

  b. What are the basic disciplines which are influencing the machine learning?　3

  c. With a clear diagram, explain the designing of the checkers learning program.　10

2 a. Consider the following sequence of positive and negative training examples describing the concept "Pairs of people who live in the same house". Each training example describes an ordered pair of people, with each person described by their sex, hair color (black, brown or blonde) height (tall, medium or short) and nationality (US, French, German, Irish, Indian, Japanese or Portuguese)

+{<male brown tall US> <female, black short US⟩}

+{<male brown short French><female black short US>}

-{<female brown tall German><female black short Indian>}

+{<male brown tall Irish> <female brown short Irish>}　10

Each hypothesis is represented by a pair of 4-tuples and attribute constraint may be 'specific value', '?' or 'ϕ'

  i) Considering this provide a hand trace of the CANDIDATE-ELIMINATION Algorithm for the training examples given. Show the specific and general boundaries of version space hypothesis starting from first positive examples.

  ii) How many distinct hypotheses are consistent with the following single positive training example

   +{<male black short Portuguese><female blonde tall Indian>}

  b. Explain ID3 algorithm for decision tree induction and explain entropy and information gain.　10

## UNIT - II

3 a. Explain the Perceptrons and derive the rule for Gradient Descent with explanation of the Gradient Descent algorithm.　10

  b. Explain Back propagation algorithm and derive the training rule for output unit weights of the Back propagation algorithm.　10

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| 4 a. | Explain Genetic algorithm and its common operators and fitness function and selection. | 10 |
| b. | What is Genetic programming? How it is represented and gives remarks on it? | 10 |

## UNIT - III

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| 5 a. | Explain Brute-force Bayes concept learning algorithm | 10 |
| b. | Explain GIBBS algorithm. | 5 |
| c. | Describe Naive Bayes algorithm. | 5 |
| 6 a. | Explain Shattering a set of instance and Vapni K-Chervonenki's dimension. | 10 |
| b. | Describe Weighted-Majority algorithm and deduce the theorem for relative mistake bound for the weighted majority. | 10 |

## UNIT - IV

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| 7 a. | Explain K-nearest neighbor learning algorithm. | 10 |
| b. | Discuss the remarks on : <br> i) K-nearest neighbor algorithm    ii) Locally weighted regression <br> iii) Lazy learning    iv) Eager learning | 10 |
| 8 a. | Explain General-to-Specific beam search with Learn-one-rule algorithm. | 10 |
| b. | Illustrate the relationship between Generalization, $\theta$-subsumption and Entailment. | 10 |

## UNIT - V

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| 9 a. | Differentiate between Inductive and Analytical learning problems and explain Analytical learning problem concept. | 10 |
| b. | Discuss the remarks on Explanation-Based learning with respect to Prolog-EBG algorithm. | 10 |
| 10 a. | Explain the process of training examples in EBNN algorithm. | 10 |
| b. | Explain Q-learning algorithm and Q-function. | 5 |
| c. | Discuss the relationship between Q-learning and Dynamic Programing. | 5 |

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