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BTECH
(SEM VII) THEORY EXAMINATION 2023-24
MACHINE LEARNING

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief.

2*10 = 20

| Q.no. | Questions |
|-------|--|
| (a) | Define Machine Learning and briefly explain its significance in today's technological landscape. |
| (b) | Differentiate between Artificial Intelligence (AI) and Machine Learning (ML), highlighting their key distinctions. |
| (c) | What is the main difference between classification and regression analysis in supervised learning? |
| (d) | Provide a brief overview of the types of support vector kernels. |
| (e) | Explain the Multidimensional Scaling. |
| (f) | How does K-Means Clustering work in unsupervised learning? |
| (g) | Define the Back propagation Algorithm in neural networks. |
| (h) | Outline the basics of the Decision Tree algorithm. |
| (i) | Explain the meaning of reproduction in genetic algorithm |
| (j) | Explain the difference between reinforcement learning and deep learning. |

SECTION B

2. Attempt any three of the following:

10*3 = 30

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| (a) | Explain the fundamental concepts of machine learning and discuss its significance in various fields. Provide examples of real-world applications of machine learning in mechanical engineering. |
| (b) | Discuss the concept of bias and variance in the context of evaluating an estimator. How do these factors impact the performance of a machine learning model, and what strategies can be employed to strike a balance between them? |
| (c) | Explain the principles of unsupervised learning and delve into the workings of K-Means Clustering and the Expectation-Maximization Algorithm. Provide real-world examples where these techniques can be effectively applied. |
| (d) | Explore the basics of Decision Trees, focusing on the ID3 Algorithm and the role of information gain and entropy. Discuss the challenges associated with decision tree learning and potential solutions. |
| (e) | Discuss the Genetic algorithm (GA) with suitable example. Also explain its advantages and applications. |

SECTION C

3. Attempt any one part of the following:

10*1 = 10

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| (a) | Discuss the key components involved in designing a machine learning system. Provide insights into the challenges and considerations during the design phase. |
| (b) | Differentiate between data science and machine learning. Discuss the overlap and unique aspects of these two fields. |

4. Attempt any one part of the following:

10 *1 = 10

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|-----|--|
| (a) | Explore the principles of Support Vector Machines (SVM). Discuss the types of support vector kernels and the challenges associated with SVM. Provide a case study on car price prediction using SVM. |
| (b) | What is regression in machine learning? Explain with examples. |

5. Attempt any one part of the following:

10*1 = 10

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|-----|--|
| (a) | Draw the cluster of following 8 points into 3 clusters: A1= (10,7), A2=(8,6), A3=(9,4), A4=(5,8), A5=(7,5), A6=(7,4), A7=(3,2), A8=(4,9). Use the k-means algorithm and Euclidean distance and take the Initial cluster centers are A2(8, 6), |
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| | A4(5, 8) & A8 (4,9). The solution up to two iterations. |
| (b) | Explore Multidimensional Scaling and Linear Discriminant Analysis in the context of unsupervised learning. How do these methods contribute to data analysis and pattern recognition? |

6. Attempt any one part of the following: 10*1 = 10

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| (a) | Introduce neural networks, covering the perceptron and the Back propagation Algorithm. Explain the convergence analysis and the universal approximation theorem for the back propagation algorithm. |
| (b) | Explore the concept of Convolutional Neural Networks (CNNs) and the different types of layers in CNN architecture. Provide a case study demonstrating the application of CNN in real-world scenarios such as self-driving cars or building a smart speaker. |

7. Attempt any one part of the following: 10*1 = 10

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| (a) | What is genetic algorithm? Explain with suitable example and give its advantages. |
| (b) | Examine the principles of Reinforcement Learning and its role in training intelligent systems. Compare and contrast reinforcement learning with supervised and unsupervised learning. Provide examples of real-world scenarios where reinforcement learning has been successfully applied. |

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