

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: BTECH
BRANCH CSE**

**SEMESTER : VI
SESSION : SP/2024**

SUBJECT: AI301 SUPERVISED LEARNING

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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| | | CO | BL | | | | | | | | | | | | | | |
| Q.1(a) | Explain the concepts of overfitting, underfitting and bias-variance trade-off related to regression model. How is bias-variance trade-off resolved. | [5] CO1 | BL2 | | | | | | | | | | | | | | |
| Q.1(b) | Appraise the method of Naïve Bayesian Classification with suitable example, advantage, and limitations. | [5] CO1 | BL2,3 | | | | | | | | | | | | | | |
| Q.2(a) | illustrate the working of McCulloch and Pitts Neuron model and their limitations with suitable example. | [5] CO2 | BL3 | | | | | | | | | | | | | | |
| Q.2(b) | How does an MLP classifier differ from McCulloch and Pitts Neuron model? Show one iteration of weight and bias update of MLP for classifying a linearly separable pattern. | [5] CO2 | BL3,4 | | | | | | | | | | | | | | |
| Q.3(a) | How the SVM method can be used in classification of linearly separable data? Explain using suitable example. | [5] CO3 | BL2,4 | | | | | | | | | | | | | | |
| Q.3(b) | Explain the SVM as an optimization problem. What is role of Kernels in SVM? | [5] CO3 | BL3 | | | | | | | | | | | | | | |
| Q.4(a) | Compute Information gain and Gini index for the attribute A considering the following data. What is one limitation of both the measures? | [5] CO4 | BL2,3 | | | | | | | | | | | | | | |
| | <table border="1" style="display: inline-table; border-collapse: collapse;"><tr><td>A</td><td>T</td><td>T</td><td>T</td><td>F</td><td>F</td><td>F</td></tr><tr><td>Class</td><td>+</td><td>+</td><td>-</td><td>+</td><td>-</td><td>-</td></tr></table> | A | T | T | T | F | F | F | Class | + | + | - | + | - | - | | |
| A | T | T | T | F | F | F | | | | | | | | | | | |
| Class | + | + | - | + | - | - | | | | | | | | | | | |
| Q.4(b) | Present one measure for post-pruning of decision trees. Analyze the benefits and limitations of doing so. | [5] CO4 | BL4,5 | | | | | | | | | | | | | | |
| Q.5(a) | What purpose is served by ensemble learning for classifier design? Contrast two methods. | [5] CO5 | BL3 | | | | | | | | | | | | | | |
| Q.5(b) | Write short notes on the method, advantage, and limitations of one of the following i) AdaBoost, ii) RandomForest | [5] CO5 | BL2 | | | | | | | | | | | | | | |

:::29/04/2024:::M