**SRM Institute of Science and Technology**

Mode of Exam

**OFFLINE**

**College of Engineering and Technology**

**School of Computing**

**DEPARTMENT OF COMPUTATIONAL INTELLIGENCE**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

**SET-1**

**Academic Year: 2023-2024 (EVEN)**

**Test: Cycle Test-III** **Date: 25.04.2024**

**Course Code & Title:** 21AIC202J/ Neural Networks and Machine Learning **ear & Sem:** 2rd & 4th  **Duration:** 100 MINUTES **Max. Marks:** 50

**COURSE ARTICULATION MATRIX (CAM)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | - | 2 | - | - | 3 | **-** | **-** | **-** | **-** | **-** | 3 | - | 2 | 3 | **-** |
| **C02** | - | 3 | - | - | 3 | **-** | **-** | **-** | **-** | **-** | 3 | - | 2 | 3 | **-** |
| **CO3** | - | 3 | - | - | 3 | **-** | **-** | **-** | **-** | **-** | 3 | - | 2 | 3 | **-** |
| **CO4** | - | 3 | - | - | 3 | **-** | **-** | **-** | **-** | **-** | 3 | - | 2 | 3 | **-** |
| **CO5** | - | 3 | - | - | 3 | **-** | **-** | **-** | **-** | **-** | 3 | - | 2 | 3 | **-** |

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| **Part – A**  **(10 x 1 = 10 Marks)**  **Instructions: multiple choice question** | | | | | | |
| **Q. No** | **Question** | **Marks** | **BL** | **CO** | **PO** | **PI Code** |
| 1 | Which of the following are regression problems? Assume that the following data is given for prediction.  i) Predicting the house price ii) Predicting whether it will rain or not on a given day iii) Predicting the maximum temperature on a given day iv) Predicting the sales of the ice-creams  A) Option 1,2  **B) Option 1,3,4**  C) Option 2,3,4  D) Option 1,2,3 | **1** | **1** | **4** | **2** | **2.1.1** |
| 2 | **Match the following:**   |  |  | | --- | --- | | Column A | Column B | | 1.Main difference between a single-layer perceptron and a multi-layer perceptron. | 1. The presence of hidden layers | | 2. Activation function commonly used in hidden layers of MLPs | 2. Dropout regularization | | 3. Backpropagation in the context of MLPs | 3. The process of updating weights and biases based on the gradient of the loss function with respect to the parameters | | 4. Technique to prevent overfitting in MLPs | 4.ReLU (Rectified Linear Unit) |   A) 1->1,2->2,3->3,4->4 B) 1->2,2->4,3->3,4->1 C) 1->3,2->2,3->1,4->4 **D) 1->1,2->4,3->3,4->2** | **1** | **1** | **4** | **2** | **2.1.3** |
| 3 | Find the name of the neural network given below:    A) Rosenblatt perceptron model **B) McCulloch-pitts model** C) Widrow’s Adaline model D) Hebbs network model | **1** | **1** | **4** | **2** | **2.1.3** |
| 4 | You are building a binary classifier for recognizing cucumbers (y=1) vs. watermelons (y=0). Which one of these activation functions would you recommend using for the output layer?  A) ReLU  B Leaky ReLU  **C) Sigmoid**  D) tanh | **1** | **2** | **4** | **5** | **2.1.2** |
| 5 | In stochastic gradient descent (SGD), what is the role of the learning rate?  a) It controls the size of the mini-batch used in each iteration.  b) It determines the number of iterations required for convergence.  **c) It adjusts the step size for updating the weights based on the gradient.**  d) It defines the number of epochs for training the model. | **1** | **2** | **4** | **5** | **2.1.2** |
| 6 | Which of the following statements is true regarding the role of hidden layers in neural networks?  a) Hidden layers directly influence the input features.  b) Each hidden layer performs a specific task such as classification or regression.  **c) Hidden layers enable the neural network to learn complex patterns in the data**.  d) Hidden layers are only present in convolutional neural networks (CNNs). | **1** | **1** | **5** | **2** | **2.1.1** |
| 7 | A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5, and 20 respectively. What will be the output? **a) 238** b) 76 c) 119 d) 123 | **1** | **2** | **5** | **2** | **2.2.1** |
| 8 | What is the purpose of activation functions in neural networks?  a) To initialize the weights and biases of neurons  b) To control the learning rate during training  **c) To introduce non-linearity into the network**  d) To compute the loss function during backpropagation | **1** | **1** | **5** | **2** | **2.2.3** |
| 9 | What will be the size of the output feature map in a convolutional neural network with an input image size of 28x28, 32 filters, and a filter size of 3x3, assuming no padding and a stride of 1?  a) 25\*25  **b) 26\*26**  c) 28\*28  d) 32\*32 | **1** | **1** | **5** | **5** | **2.4.1** |
| 10 | When you apply max pooling with a 2x2 pooling window and a stride of 1 to the given 3x3 input image, What will be the Output FeaturevMap? | **1** | **2** | **5** | **5** | **2.4.2** |
| **Part – B**  **Answer any 4 questions (4X5=20)** | | | | | | |
| 11. | Can you explain the concept of vanishing gradients in the context of training Recurrent Neural Networks (RNNs), and how does it affect the network's performance? | 5 | 2 | 4 | 5 | 5.1.1 |
| 12. | Explain the purpose and function of the input gate, forget gate, and output gate in an LSTM cell. | 5 | 3 | 5 | 2 | 5.1.2 |
| 13. | What are some common activation functions used in perceptrons, and what are their characteristics? | 5 | 2 | 4 | 5 | 5.1.2 |
| 14. | What is the architecture of a multi-layer perceptron, and what are the roles of input, hidden, and output layers? | 5 | 2 | 4 | 2 | 2.3.2 |
| 15. | How can overfitting be addressed or mitigated in neural networks? | 5 | 2 | 5 | 5 | 5.2.1 |
| **Part – C**  **Answer any 2 questions (2X10=20)** | | | | | | |
| 16. | Estimate the best-fit line using Linear regression. Suppose the number of hours studied by the student is ‘3’ then predict the grade on the exam. | 10 | 2 | 4 | 5 | 2.2.4 |
| 17. | Assume that the neurons have a sigmoid activation function, and perform a forward pass and a backward pass on the network. Assume that the actual output of y is 0.5 and the learning rate is 1. Perform another forward pass. | 10 | 2 | 5 | 5 | 5.3.1 |
| 18. | What are the main components of a CNN architecture, including convolutional layers, pooling layers, and fully connected layers? Explain in detail. | 10 | 3 | 5 | 11 | 5.1.2 |

Co and BL Coverage Graph in Question Paper

**Course-Coordinator Audit-Professor**