VII Semester BTech Examination DEC 2023	Set No.: 01
Course name: Deep Learning (CSE)	Course code: CSE 4064

Q. No.	Description	Marks	Course Outcome (1-5)	Competency Levels (1-6)
1A	Deduce the steps involved in Eigen decomposition and assess its significance in the context of deep learning.	**4**	**1**	**4**
1B	Distinguish when an algorithm is considered 'learning' and analyze the components integral to a learning algorithm. Illustrate the most common machine learning tasks and their applications.	**4**	**1**	**4**
1C	Elucidate the following with appropriate definitions: i) Major architectural design considerations of a neural network ii) Universal approximation theorem	**2**	**1**	**4**
2A	Examine a neural network configuration featuring three input units (x1, x2, x3), a hidden layer with two units (h1 and h2), and one output unit. Utilize the rectified linear unit (ReLU) activation function for both the hidden and output units. Initiate the weight parameters randomly and illustrate a single forward and backward propagation to compute the gradient, subsequently updating the parameters. Given input values (x1, x2, x3) as (0.2, 0.8, 0.4), a target output (y) of 1, a learning rate of 0.01, and a squared loss function.	**4**	**2**	**5**
2B	Illustrate the practical application of a single perceptron in resolving challenges presented by the AND and OR problems. Evaluate the constraints it faces when confronted with the XOR problem, and substantiate your observations with pertinent operations executed by both single perceptron and multilayer perceptron, integrating concrete examples	**4**	**2**	**5**
2C	Depict capacity, overfitting and underfitting in deep learning with appropriate definitions and illustrative graphs.	**2**	**2**	**4**
3A	Consider you are part of a team working on a deep learning project for medical image analysis, specifically detecting anomalies in X-ray images. The dataset is relatively small and contains X-ray images of various anatomical regions. The objective is to enhance the model's ability to identify abnormalities, such as fractures, tumors, or other pathological conditions, without acquiring additional patient data. How would you enrich the training dataset for your medical image anomaly detection model? Outline specific techniques you would employ, and explain how these strategies can contribute to improving the model's diagnostic accuracy and reliability in identifying anomalies in medical X-ray images.	**4**	**3**	**3**
3B	Examine various techniques for improving the overall performance of a deep learning image classification project through ensemble and bagging methods. Discuss these techniques in detail,	**4**	**3**	**4**

	considering how they can be employed to enhance the accuracy of neural networks trained independently on the same dataset.			
3C	Evaluate how adversarial training contributes to the regularization of parameters in deep neural networks.	**2**	**3**	**5**
4A	Analyze second-order optimization methods in the context of deep learning. Elaborate on the considerations for choosing between first-order and second-order optimization methods, providing insights into when each approach is most appropriate.	**4**	**4**	**4**
4B	Elaborate on the use of 1D, 2D, and 3D convolution operations with corresponding kernels. Additionally, discuss the rationale behind choosing convolutional neural networks over traditional neural networks, providing a detailed exploration of the advantages convolutional architectures.	**4**	**4**	**5**
4C	Compare the distinctive characteristics, architectures, and applications of Artificial Neural Network, Recurrent Neural Network, and Convolutional Neural Network.	**2**	**3**	**2**
5A	Discuss the structural differences and applications of the following recurrent neural network architectures. i) Deep Recurrent networks ii) Echo State networks iii) Recursive neural networks iv) Encoder-Decoder Sequence-to-Sequence Architectures	**4**	**2**	**4**
5B	Expound the training process of Recurrent Neural Networks. Further, illustrate and show the teacher forcing technique and its advantages.	**4**	**3**	**5**
5C	Detail on how standard transformer models address significant challenges encountered in Recurrent Neural Network.	**2**	**5**	**4**

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