

Register No : _____

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Sixth Semester

Computer Science and Engineering

CCS355 - Neural Networks and Deep Learning

(Common to Information Technology)

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Name any four key applications of neural networks.	UN	1	2
2.	What is overfitting in neural networks, and why is it a concern when training models?	UN	1	2
3.	Compare auto associative with hetero associative memory network.	UN	2	2
4.	Recall the different phases of the main operation of ART classification.	RE	2	2
5.	Is spiking neural network the same as deep neural network? Comment on it.	UN	3	2
6.	Identify two variants of the basic convolution function used in CNN.	AP	3	2
7.	Provide the significant difference between Bagging and Dropout.	UN	4	2
8.	State the VC dimension of a hypothesis set H.	RE	4	2
9.	Tell the limitations of RNN in handling sequential data.	RE	5	2
10.	Draw the general architecture of an autoencoder.	UN	5	2

PART - B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Using a diagram, Illustrate the basic model of an artificial neural network, detailing its structure and components.	UN	1	13
	Or			
	b Extend the role of activation functions in neural networks. Compare different activation functions and their impact on network performance.	UN	1	13
12.	a Provide an overview about the working principle of the temporal associative memory network and its significance in handling time-dependent data.	UN	2	13

Or

- b Explain learning vector quantization and its role in classification tasks. Also, state its advantages and disadvantages. UN 2 13
13. a A startup aims to create a CNN for classifying handwritten digits (0-9) from images. They have a dataset of 60,000 labeled images for training and 10,000 for testing. What steps should they follow to build and evaluate their model? Discuss the architecture they might use and the metrics for assessing performance. AP 3 13

Or

- b A researcher wants to use an Extreme Learning Machine (ELM) model to predict housing prices based on features such as location, size, and number of bedrooms. They have a dataset with 1,000 samples and are unsure how to implement the ELM effectively. What steps should they take to prepare their data and build the ELM model? AP 3 13
14. a Elaborate how gradient learning in deep feedforward networks uses the chain rule and backpropagation to update weights during training. Discuss the significance of the learning rate and challenges UN 4 13

Or

- b Infer the concept of batch normalization and its role in training deep neural networks. UN 4 13
15. a Explain the concept of deep recurrent networks. How does stacking RNN layers improve the model's capacity to capture complex temporal patterns? UN 5 13

Or

- b Compare and contrast various types of Auto encoders such as Complete, Regularized and Contractive. In what scenarios would you prefer one type over the others? UN 5 13

*PART – C (Marks 1*15 = 15)*

<i>Q.No</i>		<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
16.	a	Classify the following problems into the categories of supervised or unsupervised learning, based on the nature of the learning task and justify it: • Predicting customer churn in a subscription-based service using historical data • Clustering news articles into topics without labeled categories • Classifying emails as spam or not spam based on their content • Predicting housing prices based on various features like location, size, and amenities • Segmenting customers into distinct groups based on purchasing behavior • Market basket analysis to find associations between products purchased together • Diagnosing diseases based on patient symptoms and test results • Organizing images into categories based on visual similarity without predefined labels	AP	1	15

Or

- b Design a simple feedforward neural network with one input layer (2 neurons), one hidden layer (2 neurons), and one output layer (2 neurons) for the following data: AP 1 15
- Input values: $X_1=0.05$ and $X_2=0.10$
 - Initial weight: $w_{11}=0.15$, $w_{12}=0.20$, $w_{21}=0.25$, $w_{22}=0.30$, $v_{11}=0.40$, $v_{12}=0.45$, $v_{21}=0.50$ and $v_{22}=0.55$
 - Bias Values: $b_1=0.35$ and $b_2=0.60$;
 - Target Values: $T_1=0.01$ and $T_2=0.99$

Here, w is input hidden weight with b_1 bias; v is hidden output weight with b_2 bias; Calculate the output values of Hidden and Output nodes by a forward pass. Also, determine its total error. Provide the necessary formula and intermediate steps.