B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E.   **Semester: V**

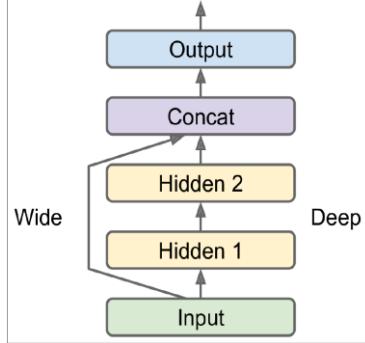**Branch: CSE (DS) and AI & DS**   **Duration: 3 hrs.**

Course Code: 23DS5PCDLG   **Max Marks: 100**

Course: Deep Learning

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		With a neat labelled diagram, describe the threshold logical unit (TLU).	CO1	PO1	**04**
	b)		Design an artificial neural network that compute A $\oplus$ B. Consider the initial weights $w_{11}=w_{12}=w_{21}=w_{22}=1$, threshold=1, learning rate = 1.5.	CO3	PO3	**10**
	c)		Evaluate the given scenarios and justify the activation function that you would use among Sigmoid, tanh or ReLU activation. i. A bank wants to predict whether a customer will default on a loan. ii. A company wants to predict the sentiment of customer reviews (positive, negative, or neutral). iii. An image recognition system aims to classify objects in images (e.g., cats, dogs, cars).	CO2	PO2	**06**
			OR			
2	a)		 Write a python program to send 5 features through the wide path (features 0 to 4) and 6 features through the deep path (features 2 to 7), with features 2, 3, and 4 going through both paths for the given architecture.	CO4	PO4	**08**

		b)	Identify the key challenges in traditional machine learning methods that have driven the development and widespread adoption of deep learning	*CO2*	*PO2*	**06**
		c)	Discuss the factors that significantly impact the efficiency and cost of deep learning models and explore ways to optimize them.	*CO2*	*PO2*	**06**
			UNIT - II			
	3	a)	Outline the structure of the AlexNet architecture and highlight its key components that contributed to advancements in image classification.	*CO2*	*PO2*	**06**
		b)	Imagine you're training a deep neural network for image classification, but the model performance starts to degrade as the number of layers increases. How can residual learning help overcome this issue and improve the model's training and accuracy?	*CO2*	*PO2*	**06**
		c)	You have a 4×4 matrix representing a single image. You apply a Convolutional Neural Network (CNN) with the following parameters: • Stride: 1 • Kernel size: 2×2 • Number of filters: 2 • No padding • Average pooling with a 2×2 filter after the convolution step. Compute the feature maps after the convolution and the pooled output.	*CO3*	*PO3*	**08**
			OR			
	4	a)	Describe the structure of the SE block in SENet and its role in improving feature representation.	*CO1*	*PO1*	**06**
		b)	Provide an overview of semantic segmentation and its primary applications in computer vision.	*CO1*	*PO1*	**06**
		c)	Write a python code to classify pictures of bees using pretrained Xception model. The bee dataset is present in tensorflow dataset as "bee_dataset". The parameters to be used for the implementation are: i. First 10% of dataset – Testing dataset ii. Next 15% of dataset – Validation dataset iii. Remaining 75% of dataset – Training dataset iv. Optimizer – SGD v. Learning Rate – 0.1 vi. Momentum – 0.8	*CO4*	*PO4*	**08**

			UNIT - III			
5	a)		Determine how do the various learning rate schedules impact the dynamics of training and the effectiveness of deep learning models?	*CO2*	*PO2*	**08**
	b)		Identify the activation functions that address the challenges of vanishing and exploding gradients in deep neural networks and explain in detail.	*CO2*	*PO2*	**06**
	c)		Suppose you are training a deep neural network on a dataset with a highly dynamic distribution of features across batches. How would you tweak the hyperparameters of batch normalization to ensure stable and efficient training?	*CO2*	*PO2*	**06**
			OR			
6	a)		Identify the types of input and output sequences in Recurrent Neural Network for the following scenarios and elaborate the same with neat diagrams. i. A company wants to predict the price of a stock based on a fixed set of attributes (e.g., previous day's closing price, trading volume, and market sentiment). ii. A content creator wants to generate a video title based on a single image thumbnail. iii. An online platform aims to detect if a customer review is positive or negative based on the text of the review. iv. A music transcription tool converts a sequence of audio frames into musical notes, with one note corresponding to each frame.	*CO2*	*PO2*	**10**
	b)		You are tasked with building a model to predict stock prices based on historical data. How would you use an RNN for this time series forecasting problem, and what challenges would you anticipate when dealing with long-term dependencies?	*CO1*	*PO1*	**10**
			UNIT - IV			
7	a)		Describe the structure of a stacked autoencoder and explain how it differs from a basic autoencoder. What benefits does a stacked autoencoder offer for unsupervised feature learning?	*CO1*	*PO1*	**10**
	b)		Identify the importance of i. Convolutional autoencoders ii. Recurrent autoencoders	*CO1*	*PO1*	**10**

			OR				
8	a)	i)	Implement the convolutional autoencoders for the Fashion MNSIT. Use the following criteria to implement the same.		*CO1*	*PO1*	**10**
			Encoder	**Decoder**			
			No. of Conv2D layers – 5	No. of Conv2D Transpose layers – 4			
			Max Pool layers – 4	Activation Function – selu			
			Activation Function – selu	Strides – 3			
			Strides – 2				
		ii)	Implement sparse autoencoder based on KL divergence regularization with the following criteria and explain the importance of sparsity loss and weight parameters.				
			weight – 1e-3, target – 0.3, activation- relu, no. of dense layers – 4				
	b)		Discuss the significance of "style mixing" in StyleGANs. How does this feature allow for greater flexibility in generating realistic and diverse images?		*CO1*	*PO1*	**10**
			UNIT - V				
9	a)		Bring out the difference between a Boltzmann Machine and a traditional feedforward neural network in terms of their structure and learning process? Why is the Boltzmann machine often considered impractical for large-scale datasets?		*CO2*	*PO2*	**10**
	b)		Describe a Deep Belief Network (DBN) and explain how it utilizes layers of Restricted Boltzmann Machines for unsupervised learning?		*CO1*	*PO1*	**10**
			OR				
10	a)		Discuss the importance and need of parallelism and distributed computing in boosting deep learning models' efficiency.		*CO1*	*PO1*	**10**
	b)		Describe the dynamic structures' switch and attention mechanisms function in deep learning systems, and what challenges are associated with implementing and optimizing dynamically structured architectures?		*CO2*	*PO2*	**10**

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