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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (2025 - 2026)

Subject: Deep Learning

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- (1.1) Backpropagation can be defined as _____.(CO1,K1) 1
- (a) It is another name given to the curvy function in the perceptron
- (b) It is the transmission of errors back through the network to adjust the inputs
- (c) It is the transmission of error back through the network to allow weights to be adjusted so that the network can learn
- (d) None of the above
- (1.2) In Delta Rule for error minimization (CO1,K1) 1
- (a) Weights are adjusted with respect to difference between desired output and actual output
- (b) Weights are adjusted with respect to difference between input and output
- (c) Weights are adjusted with respect to change in the output
- (d) no-one
- (1.3) _____ is a pooling operation that selects the maximum element from the region of the feature map covered by the filter.(CO2,K2) 1
- (a) Max Pooling
- (b) Average Pooling
- (c) Global pooling
- (d) None of these
- (1.4) The two key ideas of deep learning for computer vision_____.(CO2,K1) 1
- (a) Support Vector Machines and loss function
- (b) Convolutional neural networks and backpropagation
- (c) Deep neural networks and kernel functions

- (d) None of the above
- (1.5) What is the primary function of **padding** in a convolutional layer? (CO3,K1) 1
- (a) Reduce overfitting
 - (b) Prevent vanishing gradients
 - (c) Retain spatial dimensions of the input
 - (d) Accelerate training
- (1.6) In the YOLO algorithm, how is the input image divided for object detection? (CO3, K2) 1
- (a) By depth-wise convolution
 - (b) Into overlapping patches
 - (c) Into a grid of equal cells
 - (d) Using semantic segmentation
- (1.7) Why are Recurrent Neural Networks (RNNs) preferred for sequence data? (CO4,K1) 1
- (a) They use fixed-size inputs only
 - (b) They can capture temporal dependencies in data
 - (c) They require less memory than CNNs
 - (d) They do not need training
- (1.8) What problem does the **vanishing gradient** cause in training RNNs? (CO4,K2) 1
- (a) Makes training faster
 - (b) Causes the model to forget long-term dependencies
 - (c) Improves model accuracy
 - (d) Reduces computation cost
- (1.9) Which regularization technique randomly disables neurons during training to prevent overfitting? (CO5, K2) 1
- (a) Batch normalization
 - (b) Early stopping
 - (c) Dropout
 - (d) Weight decay
- (1.10) Which of the following is correct about Sparse autoencoder?(CO5,K1) 1
- (a) control the number of nodes in the hidden layers to increase its generalization
 - (b) add random noise to input to increase its generalization capabilities
 - (c) add random noise to input to decrease its generalization capabilities
 - (d) All of the above

2. Attempt all parts:-

- (2.1) Define the **Curse of Dimensionality** and briefly explain how it affects model performance. (CO1, K2) 2
- (2.2) Explain the convolution operation.(CO2,K2) 2
- (2.3) What is the purpose of **strided convolutions**? How do they affect the feature map size? (CO3, K2) 2
- (2.4) Write down the preference of Recurrent Neural Network over Feed Forward Neural 2

Network .(CO4,K2)	
(2.5) Explain hyper parameters.(CO5,K1)	2
SECTION-B	30
Answer any <u>one</u> of the following:-	
(3.1) Explain ROC curve with example.(CO1,K2)	6
(3.2) Explain Bias and Variance with methods of reducing High Bias and High Variance? (CO1, K4)	6
Answer any one of the following:-	
(3.3) Explain the working of a convolutional neural network (CNN) with a focus on its three core layers: convolutional, pooling, and fully connected layers. (CO2, K4)	6
(3.4) Explain the various steps used in Text Pre-processing. (CO2, K2)	6
Answer any one of the following:-	
(3.5) Explain Intersection of Union (IoU) with example. (CO3, K2)	6
(3.6) Explain the architecture and motivation of 1x1 convolutions and their role in Networks-in-Networks and Inception networks . (CO3, K4)	6
Answer any one of the following:-	
(3.7) Compare Gated Recurrent Unit (GRU) and LSTM networks in terms of structure and performance. When would you prefer one over the other? (CO4, K3)	6
(3.8) Illustrate Bidirectional RNNs.(CO4,K2)	6
Answer any one of the following:-	
(3.9) Explain the bottleneck with an example.(CO5,K1)	6
(3.10) Explain Variational Autoencoder in detail.(CO5,K2)	6
SECTION-C	50
4. Answer any <u>one</u> of the following:-	
(4.1) Derive the Backpropagation algorithm used in training a multilayer perceptron. Explain how gradient descent and the delta rule contribute to weight updates. (CO1, K6)	10
(4.2) Generate OR function using McCulloch –pitts neuron model with threshold $T=3$, $w_1=3$, and $w_2=3$. (CO1,K3)	10
5. Answer any <u>one</u> of the following:-	
(5.1) A convolutional layer takes an input image of size 32×32 with a single channel. The layer uses a 5×5 filter with a stride of 1 and padding applied such that the output size is the same as the input size. a) Calculate the amount of padding needed on each side of the input. b) What will be the size of the output feature map? After this convolutional layer, a max pooling layer with a 2×2 window and stride 2 is applied. c) Calculate the size of the output feature map after pooling. (CO2, K3)	10
(5.2) Compare image classification and text classification . Explain the role of hyper-parameter tuning in improving CNN performance.(CO2,K4)	10

6. Answer any one of the following:-

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| (6.1) | Explain YOLO algorithms with architecture. (CO3, K2) | 10 |
| (6.2) | Explain Filtering, Stride and Padding in Convolutional Neural Network. (CO3,K2) | 10 |

7. Answer any one of the following:-

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|-------|---|----|
| (7.1) | Explain in following in details i) BTT, ii)sequence model.(CO4,K2) | 10 |
| (7.2) | Discuss the challenges involved in training deep RNNs and describe how different RNN variant LSTM address these issues. Include a discussion on sequence generation techniques. (CO4, K5) | 10 |

8. Answer any one of the following:-

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| (8.1) | Give a detail on stacked autoencoder with example. (CO5, K2) | 10 |
| (8.2) | List and explain various types of autoencoders. Discuss the main characteristics and common use cases of at least three different types.(CO5,K2) | 10 |

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