PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(Third Semester)

Branch - COMPUTER SCIENCE

MAJOR ELECTIVE COURSE – II : DEEP LEARNING

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)
Answer ALL questions

ALL questions carry EQUAL marks   (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	What is the purpose of the Softmax function in a neural network? A) To classify data into binary categories. B) To transform output scores into probabilities for multi-class classification. C) To speed up training by reducing the complexity. D) To prevent overfitting in the network.	K1	CO1
	2	Which of the following is true about ReLU? A) It can produce dead neurons when the input is negative. B) It has a continuous output between -1 and 1. C) It is rarely used in deep networks. D) It is most useful in the output layer..	K2	CO1
2	3	Which of the following is true about Stochastic Gradient Descent (SGD)? A) It computes the gradient based on the entire dataset. B) It is guaranteed to converge faster than mini-batch gradient descent. C) It updates weights after each training sample. D) It always finds the optimal solution immediately.	K1	CO2
	4	What is the main advantage of using mini-batch gradient descent over stochastic gradient descent (SGD)? A) It is less computationally expensive. B) It always leads to faster convergence than batch gradient descent. C) It avoids the vanishing gradient problem entirely. D) It reduces the variance of weight updates, leading to a more stable convergence.	K2	CO2
3	5	Which of the following is true about TensorFlow variables? A) TensorFlow variables hold constant values during training. B) TensorFlow variables are mutable and can be updated during training. C) Variables are only used for storing the final output of the model. D) Variables are only used in the testing phase.	K1	CO3
	6	Which TensorFlow operation is used to create a multi-dimensional array (tensor)? A) tf.Variable B) tf.Session C) tf.constant D) tf.placeholder	K2	CO3
4	7	Which of the following is the primary function of max pooling in a convolutional neural network (CNN)? A) Increase the size of feature maps. B) Improve the accuracy of the model by adding more filters. C) Apply non-linearity to the model. D) Reduce the spatial dimensions of the feature maps while retaining the most important information.	K1	CO4
	8	What is the main advantage of using convolutional layers over fully connected layers in CNNs for image processing? A) Convolutional layers allow for more accurate classification tasks. B) Convolutional layers automatically learn spatial hierarchies in the image data, reducing the need for manual feature extraction. C) Convolutional layers are computationally slower than fully connected layers. D) Convolutional layers are only used for text-based data.	K2	CO4
5	9	Which of the following is a major limitation of traditional Recurrent Neural Networks (RNNs) when dealing with long sequences? A) RNNs can only handle fixed-length inputs. B) RNNs suffer from the vanishing gradient problem, making it difficult to capture long-term dependencies. C) RNNs cannot be trained with backpropagation. D) RNNs do not process sequential data effectively.	K1	CO5
	10	What is the primary advantage of using Long Short-Term Memory (LSTM) units over standard RNNs? A) LSTMs can learn long-term dependencies in sequences and mitigate the vanishing gradient problem. B) LSTMs are faster to train than RNNs. C) LSTMs require fewer training parameters than RNNs. D) LSTMs are only useful for image data.	K2	CO5

SECTION - B (35 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks   (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the difference between linear perceptrons and non-linear neural networks. Discuss their limitations and provide an example of a problem that a linear perceptron cannot solve.	K3	CO1
		(OR)		
	11.b.	Describe the role of activation functions in a neural network. Compare and contrast the sigmoid, tanh, and ReLU activation functions in terms of their advantages and limitations.	K3	CO1
2	12.a.	Explain the backpropagation algorithm in neural networks. How does it help in training feed-forward neural networks, and what role does it play in weight adjustment?	K4	CO2
		(OR)		
	12.b.	Describe the problem of overfitting in deep neural networks and discuss several strategies to prevent overfitting during training, such as early stopping, dropout, and regularization.	K4	CO2
3	13.a.	Explain how TensorFlow operations work and how they can be used to build machine learning models. Discuss the role of tensors in representing data and how operations manipulate them during model training.	K3	CO3
		(OR)		
	13.b.	Describe the process of specifying a logistic regression model using TensorFlow. How would you implement the model and train it on a binary classification task? Explain the main components of this model.	K3	CO3
4	14.a.	Explain the function and importance of convolutional layers in a convolutional neural network (CNN). How do filters and feature maps work together in this context? Provide an example of how a filter might detect a specific feature in an image.	K4	CO4
		(OR)		
	14.b.	Discuss the role of pooling in convolutional neural networks, focusing on max pooling. How does max pooling help in reducing the computational load and achieving translation invariance? What are the advantages of using pooling layers in CNN architectures?	K4	CO4
5	15.a.	Explain the sequence-to-sequence (Seq2Seq) model and its applications. How do neural N-grams help improve sequence generation tasks in Seq2Seq models? Discuss the challenges and benefits of applying Seq2Seq models to real-world tasks like machine translation.	K2	CO5
		(OR)		
	15.b.	Discuss the architecture of Long Short-Term Memory (LSTM) units and how they address the limitations of traditional Recurrent Neural Networks (RNNs). Explain the role of the forget, input, and output gates in the LSTM and how they contribute to learning long-term dependencies.	K2	CO5

SECTION -C (30 Marks)
Answer ANY THREE questions
ALL questions carry EQUAL Marks   (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Discuss the mechanics of machine learning in the context of neural networks. Explain the training process, including forward propagation, loss calculation, and backpropagation.	K4	CO1
2	17	Discuss the training process of feed-forward neural networks using gradient descent. Describe the challenges that arise when training neural networks, such as the vanishing gradient problem, and how these issues can be addressed.	K5	CO2
3	18	Discuss the steps involved in building and training a multilayer neural network for the MNIST dataset in TensorFlow. Include a detailed explanation of how to define the model architecture, perform forward propagation, calculate the loss, and apply backpropagation for weight updates. How can you evaluate the model's performance on test data?	K6	CO3
4	19	Provide a detailed description of the architecture of a convolutional neural network (CNN) for image classification. Include an explanation of the convolutional layers, activation functions, pooling layers, fully connected layers, and the output layer. How does each component contribute to the model's ability to learn and classify images?	K4	CO4
5	20	Describe the process of dependency parsing in natural language processing and how frameworks like SyntaxNet can help in analyzing sentence structures. What are the challenges involved in dependency parsing, and how can neural networks overcome these challenges?	K4	CO5

Z-Z-Z END