Course: B. Tech. Computer Science and Engineering (AI and ML)
Subject: Deep Learning
Subject Code: ETCS-303
Semester: V

Time: 03 Hours   **Max Marks: 70**

Instructions to the Students:

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of short answer type. All questions are compulsory. Each question carries 02 mark.
3. Section B comprises 8 long answer type questions out of which students must attempt any 5. Each question carries 10 marks.
4. Do not write anything on the question paper.

Q. No.	SECTION – A (SHORT ANSWER TYPE QUESTIONS)	Marks

1. a. Define linear separability. (2)

   b. What is a McCulloch–Pitts unit? (2)

   c. What is the saddle point problem in neural networks? (2)

   d. What do you understand about the Bias - Variance trade-off? (2)

   e. Explain underfitting and overfitting with a diagram. (2)

   f. What is backpropagation through time (BPTT) in Recurrent Neural Networks? (2)

   g. Explain the terms strides and padding. Write a formula to calculate the number of parameters in a hidden unit of a neural network. (2)

   h. Differentiate between artificial and biological neurons. (2)

   i. What is Gibbs sampling? (2)

   j. Define variational autoencoders. (2)

SECTION – B (SHORT ANSWER TYPE QUESTIONS)

2. Explain the architecture of a multilayer perceptron and its learning mechanism using backpropagation. (10)

3. a. Describe empirical risk minimization and the role of regularization in neural networks. Also explain the types of regularisation in detail with examples. (5)

   b. Explain the working of autoencoders with a diagram. (5)

4. Investigate the theoretical foundation and implementation of Adagrad and Adam optimization algorithm in the context of training deep neural networks. Also compare Adagrad and Adam optimization methods. (10)

5. Explain the working of convolutional neural networks (CNNs) using LeNet as an example in detail with diagrams. (10)

6. a. Explain the architecture of AlexNet. (5)

   b. What is gradient descent algorithm and discuss its various types. Also explain the vanishing gradient problem in detail. (5)

7. Discuss the generative adversarial networks (GANs) and their components. (10)

8. a. What are the key differences between Restricted Boltzmann Machines (RBMs) and Deep Boltzmann Machines (DBM)? (5)

   b. Compare and contrast LSTM (Long Short Term Memory) and Gated Recurrent Units (GRU). (5)

9. a. Explain the challenges and innovations in applying neural networks to multi-task and multi-view deep learning. (5)

   b. What are the key differences in the application of neural networks in vision and NLP? (5)

===END OF PAPER===