

M.E. INFORMATION TECHNOLOGY EXAMINATION, 2025
FIRST YEAR, SECOND SEMESTER
DEEP LEARNING

Time: 3 Hours

Marks: 100

Read the questions carefully and answer them.

CO1: Answer Q1 and any one from the rest.**Full marks: 25**

1. (a) Compare and contrast shallow neural networks and deep neural networks.
 (b) Identify two applications where supervised and unsupervised learning will not work.
 (c) With one example describe the Batch Gradient Descent algorithm.
 (d) What is the Softmax function and why is it needed?
(2+2+8+3)
2. (a) How do neural networks learn from the data?
 (b) Explain the operations of feed forward network with a diagram.
(3+7)
3. (a) How does the Backpropagation work in ANN. Explain with a clear diagram.
 (b) What are the challenges in Deep Learning?
(8+2)

CO2: Answer any one question**Full marks: 20**

4. (a) Discuss overfitting and underfitting with an example.
 (b) Describe the main idea behind the L2 algorithm. How does L1 regularization differ from L2 regularization?
 (c) What are hyperparameters? How does the hyperparameter get tuned?
(5+8+3+4)
5. (a) What are the regularization techniques used in deep learning?
 (b) Discuss the Bias - Variance trade off.
 (c) How does dropout help in regularizing neural networks?
 (d) Describe the main idea behind the Data Augmentation algorithm.
(3+4+8+5)

CO3: Answer any one question**Full marks: 20**

6. (a) Why are CNNs used in image processing?
 (b) With suitable example discuss the working principles of different layers of CNN.
 (c) The output layer of convolutional network is usually relatively inexpensive to learning layer. Justify.
 (d) Explain feature map.
(2+10+4+4)
7. (a) Explain: Strides, Padding.
 (b) Explain different types of pooling operation.
 (c) Discuss the architecture of CNN.
 (d) Create a chart that demonstrates convolution with a stride.
(4+4+7+5)

CO4: Answer Q8 and any one from the rest**Full marks: 25**

8. (a) Differentiate RNNs and feed forward networks.
 (b) Illustrate vanishing and exploding gradients problem in RNN.
 (c) Explain RNN and its layers, with a neat diagram.
(3+5+7)

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9. (a) What is the drawback of RNN?
 (b) Illustrate updating the cell state (hidden state also) in an LSTM network with suitable example. (2+8)
10. (a) What are Gated recurrent units? Explain GRU cell (reset, update gate).
 (b) What is a bi-directional recurrent neural network? (7+3)

CO5: Answer the following question

Full marks: **10**

11. Write short notes (any **two**): (5+5)
- (a) Generative Adversarial Networks (GAN)
 - (b) Reinforcement Learning
 - (c) Monte Carlo Methods
 - (d) Dynamic Programming

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CO1: Explain the deep learning fundamentals, including neural network architectures and activation functions.

CO2: Apply optimization algorithms and regularization techniques effectively in training deep learning models.

CO3: Demonstrate CNN architectures, utilize pre-trained models for computer vision and speech recognition tasks.

CO4: Apply RNNs, including LSTM and GRUs, for sequential data processing tasks like text generation and sentiment analysis, others NLP task.

CO5: Explore advanced topics in deep learning, including GANs, VAEs, reinforcement learning, attention mechanisms, and Transformer architectures, across various domains.