

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
III B.Tech II Semester Supplementary Examinations, November-2025
DEEP LEARNING

(Computer Science and Engineering (CSE)_DS)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

		<u>UNIT-I</u>	
1.	a)	How can the four branches of machine learning supervised, unsupervised, semi-supervised, and reinforcement learning be applied to a real-world business case of predictive maintenance in manufacturing? Provide practical examples illustrating their roles and advantages in this context.	[7M]
	b)	How can you formulate an effective method for tuning hyperparameters in probabilistic models to achieve optimal trade-offs in classification problems? Discuss the approach, techniques used, and evaluation criteria.	[7M]
		(OR)	
2.	a)	Demonstrate the use of ensemble methods (e.g., Random Forest + Boosting) to improve prediction accuracy in imbalanced datasets.	[7M]
	b)	Analyze the implications of training early neural networks with limited computational resources and propose modern alternatives.	[7M]
		<u>UNIT-II</u>	
3.	a)	Discuss how biological vision systems have inspired convolutional models in deep learning. Provide comparative insights.	[7M]
	b)	Discuss a novel approach to enhance deep neural network training using knowledge distillation? Describe the methodology in detail and justify its feasibility in terms of performance, scalability, and applicability.	[7M]
		(OR)	
4.	a)	Critically evaluate gradient vanishing and exploding problems. How does initialization affect this in deep networks?	[7M]
	b)	Design a simulation comparing traditional machine learning algorithms and deep networks on a language classification task.	[7M]
		<u>UNIT-III</u>	
5.	a)	Construct a deep neural network for sentiment analysis. Analyze the role of activation functions in final performance.	[7M]
	b)	Justify the trade-off between computational efficiency and training time when using TensorFlow versus PyTorch.	[7M]
		(OR)	
6.	a)	Explore the use of Theano in building a deep learning compiler. Is it still viable in modern environments? Defend your position.	[7M]
	b)	How does multiclass classification vary when implemented on structured data versus unstructured data? Provide example-based analysis.	[7M]
		<u>UNIT-IV</u>	
7.	a)	Create a comparative performance report between CNN and RNN on time-series data. Discuss insights drawn from real experiments.	[7M]
	b)	How do attention mechanisms enhance the performance of recurrent neural networks (RNNs) in natural language processing (NLP) applications? Analyze their impact and illustrate the architectural flow of an RNN integrated with attention.	[7M]

		(OR)	
8.	a)	How can transfer learning be implemented using pretrained CNN models on a custom dataset? Discuss the process and analyze the key challenges encountered during the fine-tuning phase.	[7M]
	b)	What optimization pipeline can be proposed for efficiently training recurrent neural networks (RNNs) on GPU-based systems? Describe the components of the pipeline and evaluate its impact on training time and model accuracy.	[7M]
		<u>UNIT-V</u>	
9.	a)	Develop a deep reinforcement learning algorithm for multi-agent robotic systems. Discuss reward strategy and convergence.	[7M]
	b)	Evaluate how GANs contribute to data augmentation in healthcare datasets. Highlight ethical concerns and limitations.	[7M]
		(OR)	
10.	a)	What are the key differences in latent space representations generated by autoencoders and deep generative models? Investigate their structural properties, interpretability, and suitability for downstream tasks.	[7M]
	b)	How can a hybrid architecture combining deep belief networks (DBNs) with long short-term memory (LSTM) networks be designed for sequential pattern mining? Describe the architecture and analyze the associated computational overhead.	[7M]
