Atal Bihari Vajpayee Indian Institute of Information Technology & Management, Gwalior

IT007: Advanced Machine Learning

Major Examination (Session 2023–24)

Maximum Time: 3 Hours **Max Marks: 45**

Note: All questions are compulsory. Use mathematical derivations and examples where applicable.

1. (a) Explain the concept of bias–variance tradeoff in machine learning. (b) How do ensemble methods help in reducing variance? (7 Marks)

2. (a) Derive the gradient update rule for logistic regression. (b) Apply it on a small dataset of your choice. (8 Marks)

3. (a) Explain kernel trick in SVMs. (b) Compare linear kernel vs RBF kernel with examples. (8 Marks)

4. (a) What is dimensionality reduction? Explain PCA with derivation of eigen decomposition. (b) Apply PCA to reduce data from 3D to 2D. (7 Marks)

5. (a) What are neural network hyperparameters? Explain their role in model performance. (b) Discuss techniques for hyperparameter tuning. (8 Marks)

6. Write short notes on any two: (i) Reinforcement learning value functions (ii) Generative Adversarial Networks (GANs) (iii) Bayesian approaches in machine learning (7 Marks)