**Question Bank: Foundations of Deep Learning**

**A. Basic Concepts (1–7)**

1. Define Machine Learning. How is it different from traditional programming?
2. What is Deep Learning, and how does it relate to Machine Learning?
3. Explain the terms **bias** and **variance** with examples.
4. What is the **bias-variance trade-off**? How does it impact model performance?
5. Define **hyperparameters** and provide three examples commonly used in deep learning.
6. Differentiate between **underfitting** and **overfitting**.
7. What is **regularization** in deep learning, and why is it used?

**B. Limitations and History (8–11)**

1. Mention at least three limitations of traditional machine learning techniques.
2. Trace the history of deep learning from its origins to modern applications.
3. Who are some key contributors to the development of deep learning?
4. How did advancements in hardware impact the rise of deep learning?

**C. Advantages and Challenges (12–15)**

1. List three major advantages of deep learning over classical machine learning.
2. Describe at least three challenges in deploying deep learning systems.
3. Why does deep learning require large amounts of data and computation?
4. Explain the **black-box** nature of deep learning and its implications.

**D. Representation Learning (16–18)**

1. What is **representation learning**, and why is it crucial in deep learning?
2. How does deep learning learn hierarchical features from raw data?
3. Explain with an example how feature extraction differs in ML vs. DL.

**E. Understanding Deep Learning (19–21)**

1. Describe how deep learning can be understood using three illustrative figures.
2. What are **common architectural principles** of deep networks?
3. How do layers, neurons, and activation functions contribute to a network's capability?

**F. Architecture & Applications (22–25)**

1. What factors influence the design of a deep learning architecture?
2. Compare and contrast shallow vs. deep neural networks.
3. List five real-world applications of deep learning with brief descriptions.
4. How is deep learning being used in healthcare, autonomous systems, or natural language processing?