SEE Question Paper Pattern - Total 30 Marks

All questions will be mandatory. Questions will be from all 5 units

Part A (10 Marks) – 2 questions of 5 Marks Each. Each question will have 2-3 sub parts.

Part B (10 Marks) – 2 questions of 10 Marks Each. Each question will have 3-4 sub parts.

Questions mostly application of concepts learned. Few numerical as well. Use diagrams to illustrate your answers wherever it is required

Unit 5

1. What are effective AI guardrails to ensure safe and reliable outputs in LLM?
2. Explain application of regulatory and legal considerations to ensure responsible use of Large Language Models (LLMs)
3. What are the ethical considerations related to bias and fairness in AI and evaluate their impact
4. Why data privacy and security in the context of LLMs are important and assess their impact on model performance and ethical considerations
5. Describe application of 'bias detection' in AI and why it is needed for fairness and accuracy in AI systems. Give 2 examples to support your answer
6. Design a guardrail system for an LLM that will be deployed in customer service. Include specific technical measures, monitoring mechanisms, and human oversight protocols to prevent harmful outputs while maintaining service quality.

Unit 4

1. Describe Retrieval-Augmented Generation (RAG) architecture, mention all its components, their interactions and explain how it enhances the accuracy of LLMs in real-world applications?
2. What is the role of a vector database in RAG?
3. Illustrate application of LLMs in following domains
   a. Software development tasks (bug detection, code refactoring, coding, testing, documenting, designing)
   b. NLP tasks
   c. Computer Vision
   d. Image Captioning / Object Detection
   e. Data Analytics
   f. Product Design

   For each domain area/ sub topics, give 2 use case examples

4. Describe the fine-tuning process and how it is beneficial for domain-specific tasks, provide two examples
5. Compare the fine-tuning and prompt engineering methods to adapt LLMs for domain specific tasks. Under what circumstances would you choose one approach over the other?

Unit 3

1. Explain use of Stable Diffusion in generating clear and detailed images
2. What are the key components of Transformer Architecture? Explain the role of the Attention mechanism, how it enhances performance in sequential processing tasks
3. Describe how transformer models are used to handle long-range dependencies in text data.
4. What are issued solved by transformer architecture compared to RNNs?
5. What is Multihead attention? How it differs from self-attention?
6. Discuss the potential advantages of diffusion models in terms of scalability and diversity of generated data
7. Compare Diffusion Models and Generative Adversarial Networks (GANs)
8. What is position encoding? Why it is needed?
9. Compare architecture of GPT and BERT? Explain difference in their use cases.
10. Design a workflow to use a GAN for generating realistic-looking images. Include the roles of both the generator and the discriminator

Unit 2

1. Determine type of prompt in the examples given below:
   a. *"Imagine you are a financial advisor; provide investment strategies for a young professional looking to save for retirement."*
   b. *Evaluate the pros and cons of online education compared to traditional classroom learning in terms of accessibility, engagement, and learning outcomes*
   c. *"List the top five benefits of regular exercise, explain how each benefit impacts physical health, and suggest three types of exercises that can be easily incorporated into a daily routine."*
   d. *Translate these sentences into French: 'Hello' → 'Bonjour' 'Goodbye' → 'Au revoir' Now translate: 'Good evening'*
   e. *"You are a professional graphical designer. Always give your designs that sets positive, sustainable, contemporary and modern looking context"*

2. Explain the concept of Multipart prompts and give one example
3. How "Root Prompt" technique controls the output of LLMs, give one example
4. Describe "RCG", "Fill in the Blank" prompting techniques. Provide one example of each type
5. Describe the key principles of Prompt Engineering and why they are critical in LLMs
6. Describe concept of iterative refinement in prompt engineering. Provide an example

7. What is the persona prompt, chain of thought, few shots prompting techniques, give examples for each?
8. Design an effective series of prompts using the Chain of Thought or other approaches for generating a summary of a business report on Hindustan Unilever Limited's 2023-24 performance

Unit 1

1. Explain utility of ReLU activation function in DL models. Mention the scenarios in which the ReLU activation function may lead to performance issues and recommend alternative activation functions that could address these challenges effectively
2. What is the role of backpropagation in training neural networks and explain how it adjusts weights based on error gradients
3. Explain RNN? Specify 3 specific use cases where they are effectively applied and why they are suitable?
4. Explain the architecture of AlexNet and what are its use cases in area of computer vision and impact
5. Why SoftMax activation function is used in the output layer of a deep learning model
6. Mention which activating function is used for regression, Binary Classification, Multi-class classification tasks, describe their respective formulas and charts
7. Explain vanishing gradient problem, how it is addressed and mechanism by which it maintains gradient flow during backpropagation?
8. What is the importance of embeddings in deep learning?
9. In a convolutional neural network, explain how pooling layers work and their impact on the output size.
10. A CNN layer with an 8x8 filter and 32 filters has 3 input channels. Calculate the total parameters, including biases
11. Calculate the number of epochs needed to complete 5000 iterations if the batch size is 50 and the dataset has 500 samples?
12. Calculate total number of updates required to train a model for 10 epochs, with dataset having 2000 samples, and a batch size of 100?