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RV COLLEGE OF ENGINEERING®
(An Autonomous Institution Affiliated to VTU)
VI Semester B. E. Regular Examinations August-2025
Artificial Intelligence and Machine Learning
GENERATIVE ARTIFICIAL INTELLIGENCE (ELECTIVE)

Time: 03 Hours

Maximum Marks: 100

Instructions to candidates:
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT	CO
1	1.1	What is the role of KL-Divergence in training Variational Autoencoders (VAEs)?	02	2	2
	1.2	What does it mean for a generative model to be "non-deterministic "?	02	1	1
	1.3	Define "Tokenization" in the context of large language models.	02	1	1
	1.4	Mention any two practical applications of diffusion models.	02	1	4
	1.5	How does inpainting differ from traditional image generation in GANs?	02	2	3
	1.6	What is the purpose of noise scheduling in diffusion models?	02	2	4
	1.7	How can latent space interpolation in VAEs be used in face generation?	02	2	2
	1.8	Why are attention-based mechanisms crucial in transformer-base generative models?	02	2	1
	1.9	List any two ethical concerns related to synthetic image generation using AI.	02	1	5
	1.10	What is the impact of biased training data on generative AI models?	02	2	5

PART-B

2	a	Define generative modeling and explain its role in deep learning. How does it differ from discriminative modeling? Provide examples of each.	08	2	1
	b	What are Large Language Models (LLMs)? Describe their architecture and training methodology in brief.	08	2	1
3	a	Explain the architecture of a Variational Autoencoder (VAE) with a neat diagram.	06	3	2
	b	Describe the training process of a VAE for generating human face images, including dataset requirements, objective function and sampling steps.	10	4	2
		OR			
4	a	Describe the architecture of a basic autoencoder, explaining the roles of the encoder and decoder components. Illustrate with a diagram.	08	3	2
	b	Demonstrate how smooth interpolation between latent vectors leads to realistic morphing between face images. Discuss its implications in creative and medical applications.	08	4	2

5	a	Explain the architecture and working of Generative Adversarial Networks(GANs).	08	2	1
	b	Suggest any four strategies to improve GAN performance and training stability.	08	4	2

OR

6	a	Compare U-Net and ResNet in the context of content retention during style transfer.	08	4	5
	b	Describe the process of training a Cycle GAN. Include the loss functions used by generator and discriminator.	08	3	2

7	a	Compare and contrast forward and reverse diffusion process in Denoising Diffusion Models (DDMs).	08	4	4
	b	Outline the architecture of a basic diffusion model and explain its training workflow.	08	3	4

OR

8	a	Compare EBMs with traditional likelihood-based generative models in terms of performance and generalization.	08	4	4
	b	What are the major challenges in using diffusion models for high resolution image synthesis?	08	4	4

9	a	Define statistical parity, equal opportunity and disparate impact. Compare their applicability.	08	2	5
	b	Suggest bias mitigation strategies suitable for generative AI models used in hiring platforms.	08	5	5

OR

10	a	Discuss the working principles of pre-processing, in-processing and post- processing techniques for bias mitigation.	08	3	5
	b	Provide real-world examples of how each type of bias can influence the outputs of generative AI models in applications such as resume generation, image synthesis or LLM-based recommendations.	08	5	5