

**BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT**

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code 

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Eighth Semester B.E. Degree Examinations, April/May 2025

**GENERATIVE AI**

(Artificial Intelligence &amp; Machine Learning)

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO: PI)</u>
<b><u>Module-1</u></b>			
1.	a. Compare and contrast discriminative and generative models in machine learning.	07	(4:1:2.6.4)
	b. What are the major challenges in training generative models?	07	(4:1:2.5.1)
	c. How does Kubernetes enhance the management of machine learning workflows?	06	(3:1:5.2.2)
<b>(OR)</b>			
2.	a. How do GANs utilize two neural networks to generate realistic data?	07	(3:1:3.2.1)
	b. What is Kubeflow and how does it help in deploying machine learning models?	07	(3:1:5.2.2)
	c. Give some real-world applications of generative AI.	06	(3:1:4.3.4)
<b><u>Module-2</u></b>			
3.	a. What are Convolutional Neural Networks (CNNs) used for?	07	(2:2:1.4.1)
	b. Describe the architecture of a Deep Belief Network (DBN). How does it differ from a simple RBM?	07	(2:2:1.4.1)
	c. Compare and contrast Hopfield network and a Restricted Boltzmann Machine (RBM)?	06	(4:2:2.6.4)
<b>(OR)</b>			
4.	a. Explain the role of optimization algorithms like Adam and gradient descent in training deep networks.	07	(2:2:1.3.1)
	b. In the context of DBNs explain with an example “explaining-away effect” and provide a solution for it?	07	(4:2:4.3.4)
	c. Describe Hopfield networks with equations.	06	(2:2:1.4.1)
<b><u>Module-3</u></b>			
5.	a. What is the purpose of the latent space in a VAE? Discuss.	07	(2:3:2.3.1)
	b. What are the two components of a Generative Adversarial Network (GAN) and explain the steps involved in training of GANs along with the objective function?	07	(2:3:2.4.1)
	c. Compare and contrast Vanilla GANs and DCGANs with respect to architecture and representation learning.	06	(4:3:2.6.4)

(OR)

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI- Performance Indicator)

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|----|----|---|----|-------------|
| 6. | a. | Describe how Inverse Autoregressive Flow (IAF) enhances the performance of a VAE.     | 07 | (2:3:2.6.4) |
|    | b. | What is mode collapse in GANs, and how can it affect the quality of generated images? | 07 | (4:3:4.3.2) |
|    | c. | With equations explain the variational objective of the VAE?                          | 06 | (2:3:2.3.1) |

**Module-4**

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| 7. | a. | Compare and contrast single-head and multi-head attention in the transformer architecture.  | 07 | (4:4:2.6.4) |
|    | b. | Explain how Convolutional Neural Networks (CNNs) can be applied to text data. Describe the process of using convolutional filters on word embeddings. | 07 | (2:4:1.4.1) |
|    | c. | What does "bidirectional" mean in the context of BERT, and how does it improve performance?   | 06 | (4:4:4.3.4) |

(OR)

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|----|----|---|----|-------------|
| 8. | a. | Compare and contrast BERT with GPT in terms of architecture and training methodology.   | 07 | (4:4:2.6.4) |
|    | b. | Discuss the advantages and limitations of CNNs compared to RNNs or LSTMs for natural language processing tasks.   | 07 | (4:4:4.3.2) |
|    | c. | Explain the concept of multi-head self-attention in transformer models. Include a labelled diagram and the relevant equations to show how multiple attention heads are computed and combined? | 06 | (2:4:1.4.1) |

**Module-5**

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| 9. | a. | Explain how LSTM models are used in symbolic music generation. What are the key components and challenges in training such a model?  | 07 | (2:5:2.1.3) |
|    | b. | How are generative models used in drug discovery, particularly in generating molecular structures? Explain using the concept of variational auto-encoders or GANs.                   | 07 | (2:5:3.2.1) |
|    | c. | Describe the concept of few-shot learning in the context of generating videos from still images. How does the model architecture support this application with the help of a figure? | 06 | (4:5:4.3.4) |

(OR)

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|-----|----|---|----|-------------|
| 10. | a. | Discuss the role of GANs in music generation using the C-RNN-GAN architecture. What is the structure of the generator and discriminator networks used?                | 07 | (2:5:5.2.2) |
|     | b. | Describe the application of generative AI in predicting protein folding structures. What role does Alpha Fold play, and how is it different from traditional methods. | 07 | (4:5:4.3.4) |
|     | c. | What is the "inverse cooking" problem in generative AI, and how do transformer architectures assist in solving it? Describe the encoding and decoding steps.          | 06 | (4:5:4.6.4) |

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