[Duration: 3 hrs]   **[Max Marks: 80]**

NB: (1) Question No. 1 is compulsory.
   (2) Attempt any three questions out of the remaining five.
   (3) All questions carry equal marks.
   (4) Assume suitable data, if required and state it clearly.

Q1.   ATTEMPT ANY FOUR   [20]

a.   Differentiate between Generative Adversarial Network and Variational Auto Encoder.

b.   Explain Sparse autoencoders.

c.   What are the benefits of pre-trained models?

d.   Explain Random Forest algorithm.

e.   Explain the limitations of 2D learning environments.

Q2. a.   Elaborate on the architecture and challenges of training GANs, particularly focusing on issues like training instability and mode collapse.   [10]

b.   A patient goes to the doctor for a medical condition, the doctor suspects three diseases as the cause of the condition. The three diseases are D1, D2, D3, which are marginally independent from each other. There are four symptoms S1, S2, S3, S4 which the doctor wants to check for presence in order to find the most probable cause of the condition. The symptoms are conditionally dependent to the three diseases as follows: S1 depends only on D1, S2 depends on D1 and D2. S3 is depends on D1 and D3, whereas S4 depends only on D3. Assume all random variables are Boolean, they are either 'true' or 'false'.   [10]
   i.   Draw the Bayesian network for this problem.
   ii.   Write the expression for the joint probability distribution as a product of conditional probabilities.
   iii.   What is the number of independent parameters required to describe this joint distribution?

Q3. a.   Explain transfer learning. Describe different types of transfer learning.   [10]

b.   Explain WGAN in detail.   [10]

Q4. a.   Explain Variational Auto Encoders in detail.   [10]

b.   Explain AdaBoost in detail.   [10]

Q5. a.   Explain Gaussian Mixture Models.   [10]

b.   Explain Conditional GAN in detail.   [10]

Q6. a.   What is metaverse? Explain the characteristics and components of the metaverse.   [10]

b.   Explain Hidden Markov Models.   [10]

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