

SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

QUESTION BANK



VII SEMESTER

AD3761 – ARTIFICIAL INTELLIGENCE - II

Regulation – 2023

Academic Year 2026 – 2027 (ODD)

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE QUESTION BANK

SUBJECT: AD3761- ARTIFICIAL INTELLIGENCE II

SEM / YEAR : VII/ IV

UNIT I PROBABILISTIC REASONING I					
Acting under uncertainty – Bayesian inference – Naive Bayes models Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.					
PART-A (2 - MARKS)					
Q. No	QUESTIONS	Competence	BT Level	CO'S	
1.	Define uncertainty in Artificial Intelligence.	BTL1	Remembering	CO1	
2.	What is probabilistic reasoning?	BTL1	Remembering	CO1	
3.	Define Bayesian inference.	BTL1	Remembering	CO1	
4.	State Bayes' theorem.	BTL1	Remembering	CO1	
5.	What is prior probability?	BTL1	Remembering	CO1	
6.	Define posterior probability.	BTL1	Remembering	CO1	
7.	What is conditional probability?	BTL1	Remembering	CO1	
8.	What is likelihood in Bayesian inference?	BTL1	Remembering	CO1	
9.	Define Naïve Bayes classifier.	BTL1	Remembering	CO1	
10.	What is a Bayesian Network?	BTL1	Remembering	CO1	
11.	What is a node in a Bayesian Network?	BTL1	Remembering	CO1	
12.	Define Directed Acyclic Graph (DAG).	BTL1	Remembering	CO1	
13.	What is exact inference in Bayesian Networks?	BTL2	Understanding	CO1	
14.	Define approximate inference.	BTL2	Understanding	CO1	
15.	What is rejection sampling?	BTL2	Understanding	CO1	
16.	Define likelihood weighting.	BTL2	Understanding	CO1	
17.	What is Gibbs sampling?	BTL2	Understanding	CO1	
18.	Differentiate prior probability and posterior probability.	BTL2	Understanding	CO1	
19.	Differentiate Bayesian Network and Naïve Bayes model.	BTL2	Understanding	CO1	
20.	List any four applications of Bayesian Networks.	BTL2	Understanding	CO1	
21.	What is a causal network?	BTL2	Understanding	CO1	
22.	Differentiate exact inference and approximate inference.	BTL2	Understanding	CO1	
23.	Why is Naïve Bayes called "naïve"?	BTL2	Understanding	CO1	
24.	Mention any two real-world applications of Bayesian inference.	BTL2	Understanding	CO1	
PART-B (16- MARKS)					
1.	Explain the concept of acting under uncertainty in AI with suitable examples.	(16)	BTL3	Applying	CO1
2.	State and derive Bayes' theorem. Explain Bayesian inference with an example.	(16)	BTL3	Applying	CO1

3.	Describe the Naïve Bayes classification algorithm with a numerical example.	(16)	BTL3	Applying	CO1
4.	Explain the architecture and components of a Bayesian Network with a neat diagram.	(16)	BTL3	Applying	CO1
5.	Construct a Bayesian Network for a medical diagnosis problem and explain inference.	(16)	BTL6	Creating	CO1
6.	Evaluate exact inference in Bayesian Networks using Enumeration and Variable Elimination.	(16)	BTL5	Evaluating	CO1
7.	Describe approximate inference methods: Rejection Sampling, Likelihood Weighting and Gibbs Sampling.	(16)	BTL3	Applying	CO1
8.	Explain causal networks with suitable examples.	(16)	BTL3	Applying	CO1
9.	Discuss probabilistic reasoning and compare deterministic and probabilistic approaches.	(16)	BTL4	Analyzing	CO1
10.	Analyze the advantages and limitations of Naïve Bayes classifier.	(16)	BTL4	Analyzing	CO1
11.	Compare Bayesian inference and frequentist inference.	(16)	BTL4	Analyzing	CO1
12.	Compare exact and approximate inference techniques.	(16)	BTL4	Analyzing	CO1
13.	Design a Bayesian Network for weather prediction and explain inference.	(16)	BTL6	Creating	CO1
14.	Discuss causal reasoning and compare causal networks with Bayesian Networks.	(16)	BTL4	Analyzing	CO1
15.	i) Explain Bayes' theorem with example. ii) Discuss applications of Bayesian Networks.	(8) (8)	BTL4	Applying	CO1
16.	i) Explain probabilistic reasoning under uncertainty. ii) Compare exact and approximate inference.	(8) (8)	BTL4	Analyzing	CO1
17.	Discuss Bayesian inference, Naïve Bayes, Bayesian Networks, exact and approximate inference, and causal networks with applications.	(16)	BTL4	Evaluating	CO1

UNIT II PROBABILISTIC REASONING II

Probabilistic reasoning over time – time and uncertainty – inference in temporal models – Hidden Markov Models – Kalman filters – Dynamic Bayesian networks, Probabilistic programming.

PART-A (2 - MARKS)

Q.No.	QUESTIONS	BT Level	Competence	CO'S
1.	Define temporal reasoning.	BTL1	Remembering	CO2
2.	What is probabilistic reasoning over time?	BTL1	Remembering	CO2
3.	Define temporal model.	BTL1	Remembering	CO2
4.	What is a Hidden Markov Model (HMM)?	BTL1	Remembering	CO2
5.	Define hidden state in an HMM.	BTL1	Remembering	CO2
6.	What is an observation sequence in an HMM?	BTL1	Remembering	CO2
7.	Define transition probability.	BTL1	Remembering	CO2
8.	What is emission probability in an HMM?	BTL1	Remembering	CO2
9.	What is the purpose of the Forward algorithm?	BTL1	Remembering	CO2
10.	Define Kalman Filter.	BTL1	Remembering	CO2
11.	What is a Dynamic Bayesian Network (DBN)?	BTL1	Remembering	CO2
12.	Define probabilistic programming.	BTL1	Remembering	CO2
13.	Differentiate Bayesian Networks and Dynamic Bayesian Networks.	BTL2	Understanding	CO2
14.	Differentiate Hidden Markov Models and Dynamic Bayesian Networks.	BTL2	Understanding	CO2
15.	What is the role of inference in temporal models?	BTL2	Understanding	CO2
16.	Why are Hidden Markov Models suitable for sequential data?	BTL2	Understanding	CO2
17.	State any two applications of Hidden Markov Models.	BTL2	Understanding	CO2
18.	Mention any two applications of Kalman Filters.	BTL2	Understanding	CO2

19.	Differentiate filtering and prediction in temporal reasoning.	BTL2	Understanding	CO2	
20.	What is smoothing in temporal inference?	BTL2	Understanding	CO2	
21.	What is the significance of Dynamic Bayesian Networks?	BTL2	Understanding	CO2	
22.	List the advantages of probabilistic programming.	BTL2	Understanding	CO2	
23.	Compare Kalman Filter and Hidden Markov Model.	BTL2	Understanding	CO2	
24.	Mention any two real-world applications of probabilistic reasoning over time.	BTL2	Understanding	CO2	
PART-B (16- MARKS)					
1.	Explain probabilistic reasoning over time and discuss temporal models with suitable examples.	(16)	BTL3	Applying	CO2
2.	Describe the structure and working of Hidden Markov Models with a neat diagram.	(16)	BTL3	Applying	CO2
3.	Explain the Forward, Backward and Viterbi algorithms used in Hidden Markov Models.	(16)	BTL3	Applying	CO2
4.	Explain the Kalman Filter algorithm and discuss its applications.	(16)	BTL3	Applying	CO2
5.	Construct a Dynamic Bayesian Network and explain its inference mechanism.	(16)	BTL6	Creating	CO2
6.	Explain probabilistic programming and its role in Artificial Intelligence.	(16)	BTL3	Applying	CO2
7.	Evaluate inference techniques in temporal probabilistic models with suitable examples.	(16)	BTL5	Evaluating	CO2
8.	Explain the applications of Hidden Markov Models in speech recognition and NLP.	(16)	BTL3	Applying	CO2
9.	Compare Hidden Markov Models and Dynamic Bayesian Networks.	(16)	BTL4	Analyzing	CO2
10.	Analyze the advantages and limitations of Kalman Filters.	(16)	BTL4	Analyzing	CO2
11.	Explain filtering, prediction, smoothing and most likely explanation in temporal models.	(16)	BTL4	Analyzing	CO2
12.	Compare Bayesian Networks and Dynamic Bayesian Networks with suitable examples.	(16)	BTL4	Analyzing	CO2
13.	Discuss probabilistic reasoning over time in dynamic environments.	(16)	BTL4	Analyzing	CO2
14.	Design an HMM for a weather prediction problem and explain the inference process.	(16)	BTL6	Creating	CO2
15.	i) Explain Hidden Markov Models with an example. ii) Explain the applications of Kalman Filters.	(8) (8)	BTL4	Analyzing	CO2
16.	i) Explain Dynamic Bayesian Networks. ii) Discuss probabilistic programming.	(8) (8)	BTL4	Analyzing	CO2
17.	Evaluate temporal probabilistic reasoning, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, and probabilistic programming with suitable applications.	(16)	BTL5	Evaluating	CO2
UNIT III DECISIONS UNDER UNCERTAINTY					
Basis of utility theory – utility functions – Multiattribute utility functions – decision networks – value of information – unknown preferences – Sequential decision problems. MDPs – Bandit problems – partially observable MDPs – Multiagent environments – non-cooperative game theory – cooperative game theory – making collective decisions.					
PART-A (2 -MARKS)		BT Level	Competence	CO'S	
1.	State the basic axioms of Utility Theory.	BTL2	Understanding	CO3	
2.	Define a Decision Network and list its main components.	BTL1	Remembering	CO3	
3.	Define the Value of Information (VOI).	BTL2	Understanding	CO3	
4.	Differentiate between a Markov Decision Process (MDP) and a Partially Observable Markov Decision Process (POMDP).	BTL1	Remembering	CO3	

5.	Explain the exploration and exploitation dilemma in Multi-Armed Bandit problems.	BTL1	Remembering	CO3
6.	Define Nash Equilibrium in non-cooperative game theory.	BTL1	Remembering	CO3
7.	Explain the concept of a Multiattribute Utility Function.	BTL2	Understanding	CO3
8.	Define a Sequential Decision Problem with a suitable example.	BTL2	Understanding	CO3
9.	Differentiate between cooperative and non-cooperative game theory.	BTL1	Remembering	CO3
10.	Explain the concept of preference independence in Utility Theory.	BTL1	Remembering	CO3
11.	Define a zero-sum game.	BTL2	Understanding	CO3
12.	Define a strategy profile in a multiagent environment.	BTL2	Understanding	CO3
13.	Explain the purpose of the Bellman Equation in solving Markov Decision Processes (MDPs).	BTL1	Remembering	CO3
14.	State the objective of the Value Iteration algorithm.	BTL1	Remembering	CO3
15.	Explain the concept of a dominant strategy in game theory.	BTL2	Understanding	CO3
16.	Explain why utility functions are used to represent risk preferences in decision making.	BTL1	Remembering	CO3
17.	Define a Pareto-optimal solution.	BTL2	Understanding	CO3
18.	State the difference between Value Iteration and Policy Iteration algorithms.	BTL1	Remembering	CO3
19.	Define collective decision making.	BTL2	Understanding	CO3
20.	Explain the condition under which the Value of Information becomes zero.	BTL1	Remembering	CO3
21.	Differentiate between risk-averse and risk-seeking behaviour using utility functions.	BTL1	Remembering	CO3
22.	Define a belief state in a Partially Observable Markov Decision Process (POMDP).	BTL1	Remembering	CO3
23.	Define the Gittins Index used in Multi-Armed Bandit problems.	BTL2	Understanding	CO3
24.	Differentiate between chance nodes and decision nodes in a Decision Network.	BTL2	Understanding	CO3

PART-B (16- MARKS)

1.	Apply the Value Iteration algorithm to a 3×3 Grid World MDP. Show the value update process for two iterations with suitable calculations.	(16)	BTL3	Applying	CO3
2.	Explain Multiattribute Utility Functions and analyze how they support decision making involving cost, safety, and performance with a suitable example.	(16)	BTL4	Analyzing	CO3
3.	Evaluate a non-cooperative game using a suitable payoff matrix. Determine whether a Nash Equilibrium exists and justify your answer.	(16)	BTL5	Evaluating	CO3
4.	Construct a Decision Network for a medical diagnosis application by identifying the decision nodes, chance nodes, utility nodes, and their relationships. Demonstrate how the network supports optimal treatment decisions.	(16)	BTL6	Creating	CO3
5.	Apply the Policy Iteration algorithm to a sequential decision problem. Illustrate the policy evaluation and policy improvement steps with a suitable example.	(16)	BTL3	Applying	CO3
6.	Compare MDPs and POMDPs, and analyze the challenges involved in solving POMDPs.	(16)	BTL4	Analyzing	CO3
7.	Explain the concept of Value of Information (VOI) and apply it to a simple decision-making problem with a suitable example.	(16)	BTL3	Applying	CO3
8.	Explain cooperative game theory and analyze how rewards or costs can be fairly shared among multiple agents with a suitable example.	(16)	BTL4	Analyzing	CO3

9.	Apply the Upper Confidence Bound (UCB1) algorithm to a Multi-Armed Bandit problem and determine the next arm to be selected using the given reward history.	(16)	BTL3	Applying	CO3
	Explain the axioms of Utility Theory and analyze the importance of transitivity in rational decision making.	(16)	BTL4	Analyzing	CO3
10.	Evaluate the advantages and limitations of Plurality, Borda Count, and Sequential Elimination methods in collective decision making. Compare their effectiveness using suitable examples	(16)	BTL5	Evaluating	CO3
11.	Design a collective decision-making framework for a multiagent environment using an appropriate voting method. Illustrate how the proposed framework enables agents to reach an optimal group decision with a suitable example.	(16)	BTL6	Creating	CO3
12.	Apply a Partially Observable Markov Decision Process (POMDP) to a robot navigation problem with noisy sensor readings and explain its state transition process.	(16)	BTL3	Applying	CO3
13.	Compare finite-horizon and infinite-horizon sequential decision problems, and analyze their impact on policy selection.	(16)	BTL4	Analyzing	CO3
14.	Explain the role of the discount factor (γ) in a Markov Decision Process (MDP). Analyze how different values of γ influence an agent's decision making with suitable examples.	(16)	BTL3	Applying	CO3
15.	Explain Multiattribute Utility Theory and apply it to solve a multi-criteria decision-making problem with a suitable example.	(16)	BTL4	Analyzing	CO3
16.	Explain the structure of a Decision Network and analyze the factors that affect its computational complexity in decision-making problems.	(16)	BTL4	Analyzing	CO3
17.	Apply the Value Iteration algorithm to a 3×3 Grid World MDP. Show the value update process for two iterations with suitable calculations.	(16)	BTL3	Creating	CO3

UNIT IV LEARNING PROBABILISTIC MODELS

Statistical learning theory – maximum-likelihood parameter learning – naive bayes models – generative and descriptive models – continuous models – Bayesian parameter learning – Bayesian linear regression – learning Bayesian net structures – density estimation EM Algorithm – unsupervised clustering – Gaussian mixture models – learning Bayes net parameters – learning HMM – learning Bayes net structures with hidden variables.

PART-A (2 -MARKS)		BT Level	Competence	CO'S
1.	Define Statistical Learning Theory.	BTL1	Remembering	CO4
2.	Define the Maximum Likelihood (ML) parameter estimation principle.	BTL1	Remembering	CO4
3.	Differentiate between Generative Models and Discriminative Models.	BTL2	Understanding	CO4
4.	State the basic assumption of the Naïve Bayes classifier.	BTL2	Understanding	CO4
5.	Define Density Estimation in machine learning.	BTL1	Remembering	CO4
6.	Explain the basic concept of the Expectation-Maximization (EM) algorithm.	BTL2	Understanding	CO4
7.	Define a Gaussian Mixture Model (GMM).	BTL1	Remembering	CO4
8.	Explain the concept of unsupervised clustering.	BTL2	Understanding	CO4
9.	Differentiate between Bayesian Parameter Learning and Maximum Likelihood Parameter learning.	BTL2	Understanding	CO4
10.	Define Bayesian Linear Regression.	BTL1	Remembering	CO4
11.	Define a hidden (latent) variable in a probabilistic model.	BTL1	Remembering	CO4
12.	Explain the concept of Bayesian Network structure learning from data.	BTL2	Understanding	CO4
13.	Explain the role of the Expectation (E) step in the EM algorithm.	BTL2	Understanding	CO4
14.	Explain the role of the Maximization (M) step in the EM algorithm.	BTL2	Understanding	CO4
15.	Define a conjugate prior and give one suitable example.	BTL1	Remembering	CO4
16.	Explain the purpose of Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) in structure learning.	BTL2	Understanding	CO4
17.	Explain how continuous probabilistic models represent and estimate parameters.	BTL2	Understanding	CO4

18.	Define overfitting in Statistical Learning Theory.		BTL1	Remembering	CO4
19.	Define the Baum–Welch algorithm.		BTL1	Remembering	CO4
20.	Explain why Bayesian Network structure learning is considered an NP-hard problem.		BTL2	Understanding	CO4
21.	Define Laplace smoothing in the Naïve Bayes classifier.		BTL1	Remembering	CO4
22.	Explain how the size of a Conditional Probability Table (CPT) depends on the number of parent nodes in a Bayesian Network.		BTL2	Understanding	CO4
23.	Differentiate between complete data and incomplete data in parameter learning.		BTL2	Understanding	CO4
24.	Define Empirical Risk Minimization (ERM).		BTL1	Remembering	CO4
PART-B(16 MARKS)					
1.	Apply the Expectation-Maximization (EM) algorithm to estimate the parameters of a Gaussian Mixture Model (GMM) using a simple dataset. Illustrate the E-step and M-step with suitable calculations.	(16)	BTL3	Applying	CO4
2.	Apply Maximum Likelihood parameter learning to estimate the parameters of a Bayesian Network with fully observable data. Illustrate the procedure with a suitable example.	(16)	BTL3	Applying	CO4
3.	Apply Bayesian parameter learning to estimate the bias of a coin using the Beta-Binomial model. Show how the posterior distribution is updated with observed data.	(16)	BTL3	Applying	CO4
4.	Apply parameter learning techniques to a Hidden Markov Model (HMM) and explain how the model learns from sequential observations with a suitable example.	(16)	BTL3	Applying	CO4
5.	Explain Bayesian Linear Regression and illustrate its learning process using a suitable example.	(16)	BTL3	Applying	CO4
6.	Explain Gaussian Mixture Models (GMMs) and illustrate their application in density estimation with a suitable example.	(16)	BTL3	Applying	CO4
7.	Analyze the differences between Generative Models and Discriminative Models with suitable examples.	(16)	BTL4	Analyzing	CO4
8.	Compare score-based and constraint-based approaches for Bayesian Network structure learning and analyze their advantages and limitations.	(16)	BTL4	Analyzing	CO4
9.	Analyze the challenges involved in learning Bayesian Network structures with hidden variables.	(16)	BTL4	Analyzing	CO4
10.	Analyze the impact of missing data mechanisms (MCAR, MAR, and NMAR) on parameter learning in Bayesian Networks.	(16)	BTL4	Analyzing	CO4
11.	Analyze the impact of choosing informative and non-informative priors in Bayesian parameter learning with suitable examples.	(16)	BTL4	Analyzing	CO4
12.	Compare Gaussian Mixture Models (GMMs) and K-Means clustering, and analyze their suitability for different types of datasets.	(16)	BTL4	Analyzing	CO4
13.	Analyze the role of regularization techniques in probabilistic learning models and explain how they help prevent over fitting.	(16)	BTL4	Analyzing	CO4
14.	Evaluate the performance of a Naïve Bayes classifier for text classification. Explain parameter estimation using Maximum Likelihood and Laplace smoothing with a suitable example.	(16)	BTL5	Evaluating	CO4
15.	Evaluate the convergence behaviour of the Expectation-Maximization (EM) algorithm in learning Hidden Markov Models (HMMs). Justify your answer with suitable examples.	(16)	BTL5	Evaluating	CO4
16.	Evaluate the performance of Gaussian Mixture Models (GMMs) and K-Means clustering for clustering multidimensional data. Justify your answer with suitable examples.	(16)	BTL5	Evaluating	CO4
17.	Design a Bayesian Linear Regression model for predicting continuous values. Illustrate the model with suitable prior and likelihood assumptions.	(16)	BTL6	Creating	CO4

UNIT V REINFORCEMENT LEARNING AND ROBOTICS					
Definition of Learning from rewards – passive reinforcement learning – active reinforcement learning – generalization in reinforcement learning – policy search – inverse reinforcement learning – applications – Robots – robotic perception – planning movements – reinforcement learning in robotics – Robotic frameworks -- applications of robotics - Philosophy, ethics, and safety of AI – the future of AI.					
PART-A (2 -MARKS)			BT Level	Competence	CO'S
1.	Define Reinforcement Learning based on the concept of learning from rewards.		BTL1	Remembering	CO5
2.	Explain how active reinforcement learning differs from passive reinforcement learning.		BTL2	Understanding	CO5
3.	What is passive reinforcement learning?		BTL1	Remembering	CO5
4.	Explain the role of policy search in Reinforcement Learning.		BTL2	Understanding	CO5
5.	Define Inverse Reinforcement Learning (IRL).		BTL1	Remembering	CO5
6.	Explain the concept of generalization in Reinforcement Learning.		BTL2	Understanding	CO5
7.	Define a reward function in Reinforcement Learning.		BTL1	Remembering	CO5
8.	Differentiate between model-based and model-free reinforcement learning.		BTL2	Understanding	CO5
9.	What is robotic perception?		BTL1	Remembering	CO5
10.	Explain the importance of planning movements in robotics.		BTL2	Understanding	CO5
11.	Define a robotic framework.		BTL1	Remembering	CO5
12.	Explain the applications of Reinforcement Learning in robotics.		BTL2	Understanding	CO5
13.	Define Robot Operating System (ROS).		BTL1	Remembering	CO5
14.	Explain the role of robotic perception in autonomous robots.		BTL2	Understanding	CO5
15.	What is policy search?		BTL1	Remembering	CO5
16.	Explain how Inverse Reinforcement Learning differs from Reinforcement Learning.		BTL2	Understanding	CO5
17.	Define Artificial Intelligence ethics.		BTL1	Remembering	CO5
18.	Explain the alignment problem in AI ethics and safety.		BTL2	Understanding	CO5
19.	State any two applications of robotics.		BTL1	Remembering	CO5
20.	Explain the importance of robotic frameworks in robot development.		BTL2	Understanding	CO5
21.	What is meant by the future of Artificial Intelligence?		BTL1	Remembering	CO5
22.	Explain the ethical and safety issues associated with Artificial Intelligence.		BTL2	Understanding	CO5
23.	Define active reinforcement learning.		BTL1	Remembering	CO5
24.	Explain the advantages of Reinforcement Learning in solving real-world problems.		BTL2	Understanding	CO5
PART-B(16 MARKS)					
1.	Apply passive reinforcement learning to determine the optimal utility values for a given environment. Illustrate the learning process with a suitable example.	(16)	BTL3	Applying	CO5
2.	Apply active reinforcement learning to a simple navigation problem and explain how an agent learns the optimal policy through interaction with the environment.	(16)	BTL3	Applying	CO5
3.	Explain the role of generalization in reinforcement learning and illustrate its application using a suitable example.	(16)	BTL3	Applying	CO5
4.	Apply policy search techniques to solve a reinforcement learning problem. Explain the steps involved with a suitable example.	(16)	BTL3	Applying	CO5
5.	Explain the role of reinforcement learning in robotics and illustrate its application in robot navigation or manipulation with a suitable example.	(16)	BTL3	Applying	CO5
6.	Explain the components of a robotic framework and illustrate how they support perception, planning, and control in autonomous robots.	(16)	BTL3	Applying	CO5
7.	Compare passive and active reinforcement learning, and analyze their advantages, limitations, and applications.	(16)	BTL4	Analyzing	CO5

8.	Analyze the importance of robotic perception in autonomous systems. Discuss how sensors and perception techniques improve robot performance.	(16)	BTL4	Analyzing	CO5
9.	Compare different movement planning techniques used in robotics and analyze their effectiveness in autonomous navigation.	(16)	BTL4	Analyzing	CO5
10.	Analyze the role of inverse reinforcement learning in learning expert behaviour. Discuss its advantages and challenges with suitable examples.	(16)	BTL4	Analyzing	CO5
11.	Analyze the ethical, safety, and societal challenges associated with Artificial Intelligence and robotics.	(16)	BTL4	Analyzing	CO5
12.	Compare passive and active reinforcement learning, and analyze their advantages, limitations, and applications.	(16)	BTL4	Analyzing	CO5
13.	Evaluate the performance of reinforcement learning techniques in solving real-world robotic applications. Justify your answer with suitable examples.	(16)	BTL5	Evaluating	CO5
14.	Evaluate the impact of Artificial Intelligence on future industrial and societal applications. Discuss the opportunities and challenges involved.	(16)	BTL5	Evaluating	CO5
15.	Design a reinforcement learning-based robotic system for autonomous warehouse navigation. Explain the learning process and the interaction between the robot and its environment.	(16)	BTL6	Creating	CO5
16.	Design an intelligent robotic framework for a smart healthcare application by integrating perception, planning, and reinforcement learning techniques.	(16)	BTL6	Creating	CO5
17.	Construct an AI-based robotic solution for a real-world application of your choice. Illustrate the system architecture and explain how AI techniques improve its performance.	(16)	BTL6	Creating	CO5