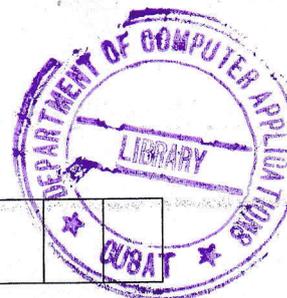


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A

**M.Sc. COMPUTER SCIENCE WITH SPECIALIZATION IN
ARTIFICIAL INTELLIGENCE SECOND SEMESTER EXAMINATION
APRIL 2025**

23-344-0201 COMPUTING PARADIGMS

(Regular)

Write any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours

Maximum Marks :50

Q.No		QUESTIONS	MARKS	CO	BL	PL
1.		What is Agile architecture? How does it differ from traditional architecture approaches?	10	CO1	L2	1.7.1
OR						
2.	a.	Describe a CI/CD pipeline with example tools.	7	CO1	L2	1.7.1
	b.	List any three quality assurance practices used in Agile development.	3	CO1	L2	1.7.1
3.	a.	What is Docker Compose and why is it used?	4	CO2	L2	1.7.1
	b.	Explain the steps involved in Dockerizing a Machine Learning Application.	6	CO2	L3	1.7.1
OR						
4.	a.	Describe the architecture of Kubernetes with the help of a labeled diagram.	6	CO2	L2	1.7.1
	b.	Discuss the need for microservices in modern ML model deployment.	4	CO2	L3	1.7.1
5.		What are the differences between public, private, and hybrid cloud deployments? Which is better suited for AI workloads?	10	CO3	L2	1.7.1
OR						
6.	a.	What are the steps to deploy a trained ML model on a cloud platform?	6	CO3	L3	1.7.1
	b.	How do cloud services support collaboration among data scientists and developers?	4	CO3	L2	1.7.1

7.		Discuss the stages of the ML pipeline that MLOps aims to automate.	10	CO4	L2	1.7.1
OR						
8.	a.	What is Kubeflow? Describe its architecture and core components.	7	CO4	L2	1.7.1
	b.	Explain how model tracking and registry work in MLFlow.	3	CO4	L2	1.7.1
OR						
9.		Assume that, You are tasked with adding two large vectors using a GPU i. Briefly describe the CUDA programming model used to parallelize such operations ii. Write a CUDA kernel for vector addition.	10	CO5	L3	1.7.1
OR						
10.	a.	Explain the role of CUDA threads and blocks.	4	CO5	L2	1.7.1
	b.	List and explain different types of memory in GPU architecture.	6	CO5	L2	1.7.1

M.Sc.(AI).II/04.25.002 Reg.No.

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B

**M. Sc. COMPUTER SCIENCE WITH SPECIALIZATION IN
ARTIFICIAL INTELLIGENCE
SECOND SEMESTER EXAMINATION, APRIL 2025**

**23-344-0203 ETHICS IN ARTIFICIAL INTELLIGENCE
(Regular)**

Write any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours

Maximum Marks :50

No		QUESTIONS	MARKS	CO	BL	PI
1	a	Write any two instances where AI systems showed discriminatory behaviour.	5	CO1	L2	8.3.1
	b	Discuss the ethical aspects of user profiling done by streaming applications, like YouTube, by analyzing search and watch history.	5	CO1	L3	8.3.1
OR						
2	a	Explain any two ways in which AI is used to manipulate the public. What are the motives?	5	CO1	L2	8.3.1
	b	Share your views on the misuse of AI in the form of deepfakes and propaganda toolkits.	5	CO1	L3	8.3.1
3		AI tools can be used in a variety of creative areas like writing, drawing, painting and music production. In this regard, give one example each for principles which are ethically right from the grounds of deontology and consequentialism. Justify your answers.	10	CO2	L3	8.3.1
OR						
4		Define any five norms towards the ethical use of artificial intelligence in product development.	10	CO2	L3	8.3.1
5		What are the recommendations put forward by DPDP Act 2023 for analytical data collection and processing?	10	CO3	L2	8.3.1
OR						

6	Explain bias types with examples.	10	CO3	L2	8.3.1
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7	Explain how biased datasets result in AI system malfunctions. Write two scenarios to support your observation. Discuss the remedies.	10	CO4	L3	8.3.1
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OR

8	What are the metrics used to measure bias in training data? Illustrate the methods. Make suitable assumptions regarding the datasets.	10	CO4	L2	8.3.1
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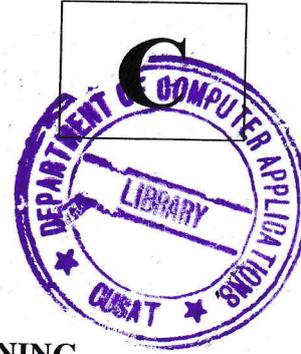
9	Explain the challenges in putting AI ethics into practice.	10	CO5	L2	8.3.1
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OR

10	What is the significance of accountability in AI development? How can we bring in accountability with transparency? Explain how explainability and interpretability contribute to transparency.	10	CO5	L3	8.3.1
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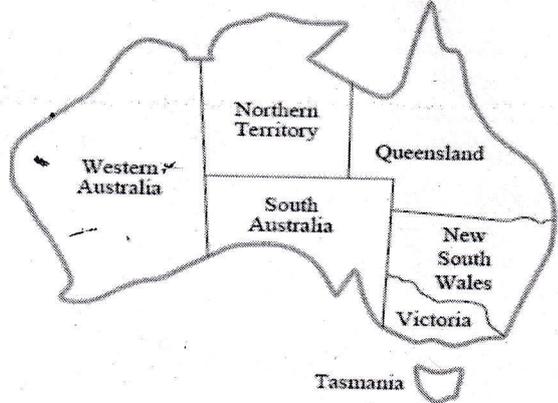
**M. Sc. COMPUTER SCIENCE WITH SPECIALIZATION IN
ARTIFICIAL INTELLIGENCE
SECOND SEMESTER EXAMINATION, APRIL 2025**

**23-344-0204 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(Regular)**

Write any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours

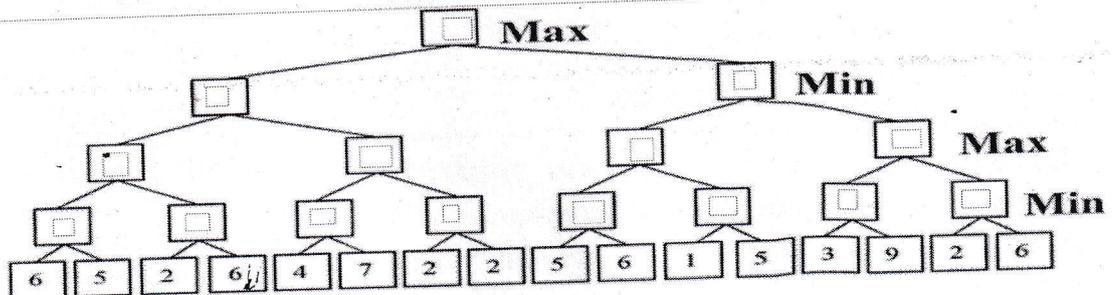
Maximum Marks :50

Qn No	Questions	Marks	CO	BL	PI
1	<p>Explain backtracking search for Constraint Satisfaction Problems. How it can be used to solve the following map-colouring problem.? Assume the use of three colours: Red, Green, and Blue.</p> 	10	CO1	L3	1.2.1
OR					
2	<p>Consider the following set of sentences:</p> <ul style="list-style-type: none"> (a) Mammals drink Milk (b) Man is Mortal (c) Man is Mammal (d) Tom is a Man <p>using Modus Ponens and Resolution, prove the following statements:</p> <ul style="list-style-type: none"> (i) Tom drinks Milk (ii) Tom is Mortal 	10	CO1	L3	1.2.1
3	<p>Explain the properties of a task environment with suitable examples. For both an Interactive English Tutor agent and a Part-Picking Robot, describe the properties of their respective task environments. Justify each property with a brief explanation.</p>	10	CO2	L2	1.1.1

OR

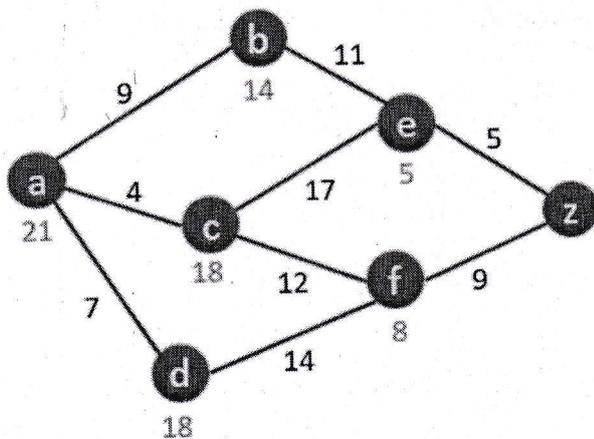
4	What do you mean by agent structure? Explain the four fundamental types of agent programs that form the basis of most intelligent systems.	10	CO2	L2	1.2.1
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5	(a) Explain the Minimax algorithm and Alpha-Beta pruning technique used in adversarial search. Apply both techniques to solve the given game tree. Based on your solution, compare and highlight the advantages of Alpha-Beta pruning over the standard Minimax approach in terms of efficiency and node evaluation.	10	CO3	L3	1.1.1
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OR

6	Consider the following graph. The numbers written on edges represent the distance between the nodes. The numbers shown beneath the nodes represent the heuristic values. Find the most cost-effective path to reach from start state 'a' to the goal state 'z' using greedy best first search and A* Algorithm. Also, compare the paths obtained by the two algorithms in terms of cost, efficiency, and optimality.	10	CO3	L3	1.1.2
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7	(a) In a retail environment, patterns in customer purchasing behaviour often reveal valuable associations between products. Describe a data mining technique that uncovers such frequent item sets by leveraging the property that all non-empty subsets of a frequent itemset must also be frequent.	5	CO4	L3	1.1.2
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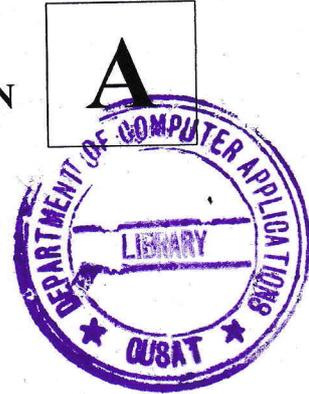
	(b)	Discuss the concept of bias-variance trade off in machine learning. How does it impact the model's performance?	5	CO4	L2	1.1.2
OR						
8	(a)	Dimensionality often clouds the clarity of data insights. Describe a mathematical technique that transforms correlated variables into a set of linearly uncorrelated components, enabling effective data compression and visualization.	5	CO4	L3	1.1.2
	(b)	Compare and contrast Support Vector Machines (SVM) and Random Forest in terms of classification.	5	CO4	L2	1.1.2
OR						
9	(a)	Consider a computational model inspired by biological neurons that performs binary classification using a linear decision boundary. Elaborate on this model with a suitable architectural sketch. How does this approach evolve when extended to solve non-linearly separable problems through layered abstraction.	5	CO5	L3	1.1.2
	(b)	Explain the working of the backpropagation algorithm in training deep neural networks.	5	CO5	L2	1.1.2
OR						
10	(a)	Explain activation functions in neural networks in detail. Explain the advantages and disadvantages of each activation functions.	5	CO5	L2	1.1.2
	(b)	What is batch normalization? Explain how it improves deep learning models.	5	CO5	L2	1.1.2

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**M. Sc. COMPUTER SCIENCE WITH SPECIALIZATION IN
ARTIFICIAL INTELLIGENCE
SECOND SEMESTER EXAMINATION, APRIL 2025**

**23-344-0213 DIGITAL IMAGE PROCESSING
(Regular/supplementary)**



Answer any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours

Maximum Marks :50

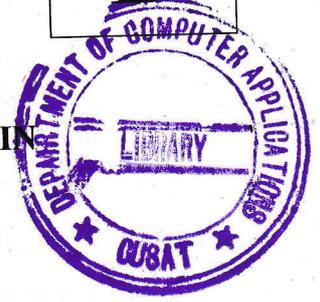
Q.Nos	QUESTIONS		MARKS	CO	BL	PI
1	a.	Explain the concepts of sampling and quantization. How do changes in sampling rate and quantization levels affect the quality of a digital image? Illustrate your answer with suitable examples.	6	CO1	L2	1.4.1
	b.	Given a 3×3 kernel and a small 5×5 image matrix, demonstrate both convolution and correlation operations step by step. Highlight the differences in the results.	4			
OR						
2	a.	Explain the steps involved in performing histogram equalization on a grayscale image. How can histogram equalization enhance the visibility of features in low-contrast medical images?	6	CO1	L2	1.4.1
	b.	Compare gradient-based filters with the Laplacian filter. In what scenarios would you prefer one over the other?	4			
OR						
3	a.	What is the purpose of applying the Discrete Fourier Transform (DFT) to an image, and how does it help in understanding the frequency characteristics of the image? Explain with an example.	6	CO2	L2	1.4.1
	b.	Describe the steps involved in applying homomorphic filtering to an image. Why is a logarithmic transformation used before processing in the frequency domain?.	4			
OR						

4	a.	Explain the steps involved in applying a frequency domain filter to an image using DFT. What is the significance of shifting the zero-frequency component to the center of the spectrum before applying a frequency filter?	6	CO2	L2	1.4.1
	b.	What is an Ideal low-pass filter? How does the cut-off frequency in a low-pass filter affect the degree of blurring in the output image? Explain with an example.	4			
OR						
5	a.	What is salt-and-pepper noise? How does the density of salt-and-pepper noise impact the performance of filtering techniques like the median filter? Explain with examples.	6	CO3	L2	1.4.1
	b.	In what situations would you choose a max filter or min filter over a median filter in noise reduction tasks? Explain with examples.	4			
OR						
6	a.	Explain Adaptive Median Filter. Give the advantages of Adaptive Median Filter over traditional Median Filter.	6	CO3	L2	1.4.1
	b.	What is Gaussian noise? Explain a method for reducing Gaussian noise in an image.	4			
7.	a.	Explain in detail the Canny Edge Detector.	7	CO4	L2	1.4.1
	b.	Differentiate between Region Growing and Region Splitting and Merging Segmentation.	3		L2	
OR						
8.	a.	Explain segmentation using K-Means clustering.	7	CO4	L2	1.4.1
	b.	Give the significance of Image Gradient in detection of edges.	3			
9.		Explain in detail the Huffman Coding with example.	10	CO5	L3	1.4.1
OR						
10.		What are the disadvantages of Golomb codes? Compute the Golomb code, $G_2(5)$.	10	CO5	L3	1.4.1

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B



**M. Sc. COMPUTER SCIENCE WITH SPECIALIZATION IN
ARTIFICIAL INTELLIGENCE
SECOND SEMESTER EXAMINATION, APRIL 2025**

**23-344-0202 ADVANCED DATABASE TECHNOLOGIES
(Regular)**

**Answer any FIVE questions.
(Each Question Carries 10 Mark)**

Time-3 Hours

Maximum Marks :50

Q.No	QUESTIONS	MARKS	CO	BL	PI
1	a. What are the key points and differences between sharding and partitioning in a distributed database system?	5	CO1	L3	1.7.1
	b. What is a distributed database? Explain the concepts of data fragmentation and replication.	5	CO1	L2	1.7.1
OR					
2	a. Discuss concurrency control techniques in distributed systems.	5	CO1	L3	1.7.1
	b. Explain distributed transactions and the Two-Phase Commit Protocol with a diagram.	5	CO1	L2	1.7.1
OR					
3	a. Explain the four main types of NoSQL databases with detailed examples.	5	CO2	L3	1.7.1
	b. A social media platform has users, posts, followers, likes, and comments. Which parts of the data would you embed, and which would you separate into collections? Why?	5	CO2	L2	1.7.1
OR					
4	a. How does MongoDB handle horizontal scaling through sharding? Describe how data is distributed and what happens if a shard becomes unavailable.	5	CO2	L2	1.7.1

	b	<p>In a MongoDB collection named employees, each document represents an employee with fields: name (string), age (integer), department (string), and isManager (boolean). Write MongoDB commands to perform the following operations:</p> <ol style="list-style-type: none"> I. Create an index on the name field for efficient querying. II. Update all employees in the "IT" department who are not managers to set their age to 35 and remove the isManager field using the unset operator. III. Find employees who are either managers or aged 40 or above in the "Sales" department, selecting only the name and department fields. IV. Check if any employee exists with the name "John Doe" and is aged 30. 	5	CO2	L3	1.7.1
5	a.	Explain XML date format in detail. Describe the structure of XML data with suitable examples.	4	CO3	L2	1.7.1
	b.	<p>For the given XML representation :</p> <p><i>Uni = (setof(Dept), setof(Course), setof(Teaches), setof(Instructor),)</i></p> <p><i>Dept = dept_name, building, budget</i></p> <p><i>Course = title, credit, course_id, dept_name</i></p> <p><i>Teaches = IID, course_id</i></p> <p><i>Instructor = IID, name, dept_name</i></p> <p>Write XQuery to;</p> <ol style="list-style-type: none"> I. Display details of all courses along with details of instructors who teach them. II. Display names of all departments along with the sum of salaries of instructors in that department. III. Find names of those courses which have the same credit value. 	6	CO3	L3	1.7.1

OR

6	a.	What is JSON ? Explain how JSON can be used in python with suitable examples.	5	CO3	L3	1.7.1
	b.	<p>Given the following JSON object:</p> <pre>{ "students": [{"name": "Alice", "age": 22, "courses": ["DBMS", "Algorithms"]}, {"name": "Bob", "age": 23, "courses": ["Networks", "OS"]}] }</pre> <p>I. Convert the given JSON data into a Pandas DataFrame and display it as a table.</p> <p>II. Define a JSON Schema for validating a JSON object representing an employee with fields: name (string), age (integer), and department (string).</p>	5	CO3	L2	1.7.1
7	a.	Suppose you are creating a web application using Firebase for students of a class to upload their details and a photo of their aadhar card. Explain in detail all steps required to create this application. Use at least 4 firebase services and explain how these services can be incorporated / modified to suit your application.	10	CO4	L3	1.7.1

OR

8	a.	Explain the architecture of Firebase and its major components.	5	CO4	L2	1.7.1
	b.	Explain Firebase security rules, its key capabilities and Firebase security rule language in detail.	5	CO4	L2	1.7.1
9		Explain map- reduce architecture. Consider a problem to count the number of occurrences of each word in a paragraph. Explain how map reduce can be used to solve above problem.	10	CO5	L3	1.7.1
10	a.	Explain the architecture of Hadoop. Describe the roles of NameNode and DataNode.	5	CO5	L2	1.7.1
	b.	Explain the architecture of Hive with a neat diagram.	5	CO5	L2	1.7.1
