ICSE

For 2026

Class 10

Features

- Variety of Question Types
- Helpful for Self-Assessment
- Aligned with Curriculum
- Comprehensive Coverage
- Variety of Difficulty Levels

ROBOTICS & ARTIFICIAL INTELLIGENCE

Specimen Question Paper

KP Publication

ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER: 1

ROBOTICS AND ARTIFICIAL INTELLIGENCE

Maximum Marks: ***100***

Time allowed: ***Two hours***

Answers to this Paper must be written on the paper provided separately.

You will ***not*** *be allowed to write during the first* ***15*** *minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

Attempt ***all*** *questions from* ***Section A*** *and* ***any four*** *questions from* ***Section B.***

The intended marks for questions or parts of questions are given in brackets[ ].

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

SECTION A

(Attempt all questions.)

Question 1 [20]

Choose the correct answers to the questions from the given options.

i. What is the primary function of a robot?
   a) To perform tasks autonomously
   b) To provide entertainment
   c) To gather information
   d) To replace humans in all tasks

ii. Which of the following is NOT a common application of robots?
   a) Industrial manufacturing
   b) Space exploration

c) Playing musical instruments
d) Water purification

iii. Which of the following is a key factor in designing a robot's control system?
a) Colour of the robot
b) Energy efficiency
c) Size of the robot
d) Aesthetic design

iv. What is the function of a robot's feedback system?
a) To control the movement of actuators
b) To monitor the performance of sensors
c) To send data to a remote operator
d) To adjust the robot's actions based on its environment or task

v. Which of the following best describes a 'collaborative robot' (cobot)?
a) A robot that works autonomously without human intervention
b) A robot that is designed to work safely alongside humans
c) A robot that is used for educational purposes
d) A robot that operates in space environments

vi. Which type of actuator is typically used for small, precise movements in robots?
a) Electric motors
b) Hydraulic actuators
c) Pneumatic actuators
d) Stepper motors

vii. Which robot component converts electrical energy into mechanical motion?
a) Sensor
b) Actuator
c) Controller
d) Power supply

viii. Which technology is used in smart homes to control appliances remotely?
a. Artificial Intelligence
b. Internet of Things (IoT)
c. Virtual Reality
d. Augmented Reality

ix. Which is the main difference between autonomous and driver-assisted cars?
a) Autonomous cars require no human interaction
b) Driver-assisted cars can drive completely on their own
c) Autonomous cars require human supervision
d) Driver-assisted cars cannot navigate roads

x. Which of these is an example of an internal sensor in robotics?
a) Force sensor
b) Proximity sensor
c) Temperature sensor
d) Vision sensor

xi. Which joint is characterized by rotational motion?
a) Prismatic joint
b) Revolute joint
c) Universal joint
d) Pin joint

xii. What does the Turing Test assess?
a) Human intelligence
b) Machine intelligence
c) Robot movement

d) Sensor accuracy

xiii. In the context of AI, what is data exploration?
   a) Cleaning data
   b) Presenting data visually to identify patterns
   c) Writing algorithms
   d) Storing data for future use

xiv. Which Python library is commonly used for data manipulation and analysis?
   a) NumPy
   b) Pandas
   c) SciPy
   d) Matplotlib

xv. Which of the following is an example of a tuple operation in Python?
   a) Adding elements to a tuple
   b) Modifying elements of a tuple
   c) Deleting a tuple
   d) Converting a list into a tuple

xvi. Which of the following best describes hacking?
   a) Legal access to a computer system
   b) Unauthorized access to a computer system
   c) The process of developing computer programs
   d) Creating firewalls for network security

xvii. What is the primary goal of cyber security?
   a) To create new software applications
   b) To protect systems, networks, and data from unauthorized access
   c) To monitor user activities online
   d) To restrict internet usage

xviii. Which of the following is essential for training a machine learning model?
   a) Algorithms
   b) Data
   c) Both a and b
   d) None of the above

xix. Which step involves dividing data into training and testing sets?
   a) Data acquisition
   b) Data pre-processing
   c) Data modelling
   d) Data evaluation

xx. What does the gear ratio determine?
   a) The speed and torque relationship between gears
   b) The weight of the gears
   c) The colour of the gears
   d) The energy consumption of the system

Question 2

Answer the following questions:

1. What are the main components of a smart home robotic system? [2]
2. Mention two advantages of using cobots in the healthcare sector, particularly in surgeries or patient care. [2]
3. Explain the function of actuators in robotic systems. [2]
4. Differentiate between Analog and Digital Signals. [2]
5. Outline the basic steps involved in supervised learning. [2]
6. What is Machine Intelligence, and how does it differ from human intelligence? [2]
7. What is data acquisition in the context of an AI project, and why is it important? [2]

8. What will be the output of the code given below: [2]

```
my_list = [100, 200, 300, 400, 500];
print("The number is ", my_list[1])
```

9. What will be the output of the code given below: [2]

```
import numpy as np
arr = np.array([10, 20, 30, 40, 50]);
print(arr[3]);
```

10. What will be the output of the code given below: [2]

```
text = "Robotics Learning";
print(text[9:])
```

SECTION B

(Answer any four questions from this Section.)

Question 3

(i) How do assistant robots enhance the efficiency of operations in the manufacturing industry? Provide two specific examples. [3]

(ii) What are the main differences between emotional responses in humans and logical responses in machines? [3]

(iii) Write a Python program to plot a line graph using the Matplotlib library. Your program should: [9]

1. Import the necessary libraries.
2. Create a list of data points for the x and y axes.
3. Plot the line graph with appropriate labels and a title.

Question 4

(i) Explain the key differences between autonomous robots and semi-autonomous robots. Why semi-autonomous robots are considered more adaptable for complex environments? [3]

(ii) Describe the steps involved in a machine learning project using the example of email classification. [3]

(iii) Create a user-defined function isEven() to accept a number and return True if the number is even; otherwise, return False. (A number is said to be even if it is divisible by 2) [9]

Question 5

(i) Define the role of actuators in robotics. Differentiate between linear and rotary actuators with examples. [3]

(ii) List three ethical concerns related to the use of artificial intelligence in decision-making. [3]

(iii) Taxi service charges based on the distance travelled, according to the following criteria: [9]

Kilometres	**Rs**
5	10/km
10	8/km
15	5/km

Write a program to calculate the fare based on the distance travelled.

Question 6

(i) Explain the use of CAD software in designing robotic components. What are the benefits of visualizing assembly and movement using CAD software? [3]

(ii) Explain how the phenomenon of phishing can lead to data theft and what precautions can be taken to avoid it. [3]

(iii) Write a Python program that performs the following operations on a list of integers: [9]

1. Create a list of integers: [15, 25, 35, 45, 55].
2. Append the integer 65 to the list.
3. Insert the integer 30 at index 3.
4. Reverse the list.
5. Find the maximum value in the list and print it.
6. Print the final list.

Question 7

(i) Explain the significance of integrating sensors, actuators, and controllers in robotic systems. How do they work together to achieve the desired functionality? [3]

(ii) Why is it essential to clearly define the problem statement in an AI project? Discuss how a well-defined problem statement contributes to the project's efficiency and success. [3]

(iii) Write a Python program that performs the following operations on a tuple:

1. Create a tuple with the elements: (2, 4, 6, 8, 10).
2. Access and print the element at index 1.
3. Convert the tuple into a list.
4. Append the integer 12 to the list.
5. Convert the list back into a tuple.
6. Print the final tuple.

Question 8

(i) Describe the process of building a basic wheeled mobile robot. Mention the key components involved in its construction. [3]

(ii) List and briefly describe three different methods of visually representing data. [3]

(iii) Write a Python program that performs the following operations on a string: [9]

1. Create a string with the value "Machine Learning".
2. Convert the entire string to lowercase and print the result.
3. Find and print the position of the substring "Learning" within the string.
4. Replace the substring "Machine" with "Deep" and print the new string.
5. Check if the string ends with "Learning" and print the result (True/False).
6. Count and print the number of occurrences of the letter 'e' in the string.

ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER: 2

ROBOTICS AND ARTIFICIAL INTELLIGENCE

Maximum Marks: ***100***

Time allowed: ***Two hours***

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SECTION A

(Attempt all questions.)

Question 1 [20]

Choose the correct answers to the questions from the given options.

(i) Match the robots with their fields of application:

a) Surgical Robots

b) Manufacturing Robots

c) Delivery Drones
d) Space Exploration Robots

(ii) Which of the following uses a probabilistic model?
a) Financial accounting
b) Weather forecasting
c) Recipe calculations
d) Calendar scheduling

(iii) Which statement about autonomous cars is true?
a) They operate without any need for human intervention.
b) They rely on advanced sensors and AI for navigation.
c) They are not yet commercially available.
d) They can only be used in closed environments.

(iv) Arduino boards can be used to control simple robotic systems.
a) True
b) False

(v) In the control system block diagram:
[Input] → [Controller] → [Actuator] → [Feedback]
Which component interacts directly with the physical environment?
a) Input
b) Actuator
c) Controller
d) Feedback

(vi) What is the role of sensors in a robotic system?
a) To execute the robot's movements
b) To collect data from the environment
c) To store programming instructions
d) To power the actuators

(vii) Which character is used to create a multi-line comment in Python?
a) """
b) #
c) //
d) <!—

(viii) LIDAR is an example of:
a) Pressure sensor
b) Vision sensor
c) Distance sensor
d) Solar sensor

(ix) Which of the following represents the square of a number in Python?
a) x^2
b) x**2
c) x//2
d) x*2

(x) What is the main function of a microcontroller in robotics?
a) To store large amounts of data
b) To process instructions and control actions
c) To provide power to the system
d) To regulate temperature

(xi) In AI, data is critical because it:
a) Executes decisions made by the machine
b) Acts as training input for models
c) Controls robot movement directly

d) Stores program instructions

(xii) Which component in a robot helps it physically interact with its environment?

a) Sensors
b) Actuators
c) Processors
d) Feedback systems

(xiii) Which statement describes the goal of the Loebner Prize?

a) It tests the speed of AI systems.
b) It evaluates a machine's ability to pass the Turing Test.
c) It measures the strength of computer processors.
d) It determines the programming efficiency of AI systems.

(xiv) What is the primary purpose of encryption in cyber security?

a) To organize data for faster retrieval
b) To protect sensitive information from unauthorized access
c) To enhance user experience
d) To ensure compatibility across systems

(xv) **Assertion (A):** Machine learning models improve over time with data.
Reason (R): Machine learning uses fixed algorithms for prediction.

a) Both A and R are true, and R is the correct explanation of A
b) Both A and R are true, but R is not the correct explanation of A
c) A is true, but R is false
d) A is false, but R is true

(xvi) What are the 5 Ws commonly used in problem analysis?

a) Who, What, When, Where, Why
b) What, Why, Where, When, Which
c) Who, Where, Why, What, Which
d) Where, Why, When, Who, What

(xvii) Which type of chart is most suitable for comparing parts of a whole?

a) Line chart
b) Bar graph
c) Pie chart
d) Scatter plot

(xviii) What does the following Python code output?

```
list = [10, 20, 30, 40]
print(list[1:3])
```

a) [10, 20]
b) [20, 30]
c) [30, 40]
d) [20, 30, 40]

(xix) The full form of CSV is:

a) Comma-Separated Values
b) Common String Variables
c) Computer System Variables
d) Centralized Software Version

(xx) Which operation is allowed on immutable data types in Python?

a) Update
b) Delete
c) Access
d) Append

Question 2

Answer the following questions:

1. What are the key sensors used in a smart car robotic system, and their primary functions? [2]

2. Mention two benefits of using robotic systems in agriculture, particularly in planting or harvesting crops. [2]
3. Explain the role of controllers in robotic systems. [2]
4. Differentiate between a Microprocessor and a Microcontroller. [2]
5. Outline the basic steps involved in unsupervised learning. [2]
6. What is Artificial Intelligence, and how is it different from conventional programming? [2]
7. Define data pre-processing in the context of an AI project, and why is it essential? [2]
8. What will be the output of the code given below: [2]

```
nums = [10, 20, 30, 40, 50]
print("The first number is:", nums[0])
```

9. What will be the output of the code given below: [2]

```
import numpy as np
matrix = np.array([[1, 2], [3, 4], [5, 6]])
print(matrix[2][1])
```

10. What will be the output of the code given below: [2]

```
word = "Artificial Intelligence"
print(word[:10])
```

SECTION B

(Answer any four questions from this Section.)

Question 3

(i) How do autonomous drones improve efficiency in logistics and delivery services? Provide two specific examples. [3]

(iv) What are the key differences between decision-making processes in humans and algorithms in machines? [3]

(v) Write a Python program to plot a bar graph using the Matplotlib library. Your program should: [9]

1. Import the necessary libraries.
2. Create a list of categories for the x-axis and their corresponding values for the y-axis.
3. Plot the bar graph with appropriate labels for the x and y axes, and add a title.

Question 4

(iv) Discuss the main differences between humanoid robots and industrial robots. Why are humanoid robots considered more suitable for human-centric environments? [3]

(v) Explain the steps involved in an AI project using the example of building a recommendation system for online shopping. [3]

(vi) Define a user-defined function isPositive() to accept a number and return True if the number is positive; otherwise, return False. (A number is positive if it is greater than 0.) [9]

Question 5

(iv) Explain the role of sensors in robotics. Differentiate between proximity sensors and vision sensors with examples. [3]

(v) Discuss the role of controllers in robotics. Differentiate between open-loop and closed-loop control systems with examples.

(vi) An internet service provider charges fees based on data usage according to the following criteria: [9]

Data Usage (GB)	Charge (Rs)
Up to 10	50/GB
11 to 20	40/GB
Above 20	30/GB

Write a program to calculate the total bill based on the data usage entered by the user.

Question 6

(iv) Explain the role of simulation software in designing robotic systems. How can simulation help in detecting potential issues before physical construction? [3]

(v) Explain the concept of data encryption and how it helps in securing sensitive information. [3]

(vi) Write a Python program that performs the following operations on a list of integers: [9]

1. Create a list of integers: [10, 20, 30, 40, 50].
2. Append the integer 60 to the list.
3. Insert the integer 25 at index 2.
4. Remove the first occurrence of 40 from the list.
5. Find the minimum value in the list and print it.
6. Print the final list.

Question 7

(iv) Explain the function of feedback systems in robotic control. How does feedback improve the accuracy and performance of robots in dynamic environments? [3]

(v) Explain the process of gathering requirements in an AI project. How does a comprehensive requirements analysis contribute to the overall efficiency of AI solutions? [3]

(vi) Write a Python program that performs the following operations on a tuple: [9]

1. Create a tuple with the elements: (1, 3, 5, 7, 9).
2. Access and print the element at index 2.
3. Convert the tuple into a list.
4. Append the integer 11 to the list.
5. Convert the list back into a tuple.
6. Print the final tuple.

Question 8

(iv) Describe the process of building a basic wheeled mobile robot. Mention the key components involved in its construction. [3]

(v) Discuss the impact of malware attacks on organizational data and suggest preventive measures to safeguard against malware. [3]

(vi) Write a Python program that performs the following operations on a string: [9]

1. Create a string with the value "Artificial Intelligence".
2. Convert the entire string to uppercase and print the result.
3. Find and print the position of the substring "Intelligence" within the string.
4. Replace the substring "Artificial" with "Cognitive" and print the new string.
5. Check if the string starts with "Artificial" and print the result (True/False).
6. Count and print the number of occurrences of the letter 'i' in the string.

ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER: 3

ROBOTICS AND ARTIFICIAL INTELLIGENCE

Maximum Marks: ***100***

Time allowed: ***Two hours***

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SECTION A

(Attempt all questions.)

Question 1 [20]

Choose the correct answers to the questions from the given options.

(i) Which component acts as the "brain" of a robot?
a) Actuator
b) Sensor
c) Controller
d) Power supply

(ii) What is the primary purpose of using sensors in a robot?
a) To process data
b) To detect environmental changes
c) To store information
d) To control movement

(iii) Which of the following is an example of an end effector in a robotic arm?
a) Camera

b) Motor
c) Gripper
d) Sensor

(iv) Which power source is commonly used in mobile robots?
a) Hydraulic power
b) Pneumatic power
c) Battery power
d) Steam power

(v) Which type of robot is commonly used in surgical applications?
a) Mobile robot
b) Humanoid robot
c) Autonomous robot
d) Teleoperated robot

(vi) Which of the following is NOT a characteristic of artificial intelligence?
a) Learning from experience
b) Adapting to new situations
c) Performing tasks randomly
d) Decision-making

(vii) Which type of robot mimics human-like actions?
a) Autonomous robot
b) Mobile robot
c) Humanoid robot
d) Industrial robot

(viii) Which factor determines a robot's degree of freedom?
a) Number of actuators
b) Number of sensors
c) Power supply
d) Size of the robot

(ix) Which of the following is an example of machine learning in robotics?
a) A robot following a pre-programmed path
b) A robot learning to recognize objects over time
c) A robot executing a single repetitive task
d) A robot powered by a battery

(x) What role do encoders play in robotic systems?
a) Measure rotational position
b) Control electrical signals
c) Store programming code
d) Provide power to the robot

(xi) Which of the following is an example of an AI-based application?
a) A mechanical clock
b) A simple calculator
c) A voice assistant like Alexa
d) A digital thermometer

(xii) Which term refers to the process of a robot navigating an environment without human intervention?
a) Teleportation
b) Automation
c) Localization
d) Machine vision

(xiii) What is the main advantage of using LiDAR in robots?
a) It provides real-time mapping and navigation
b) It stores large amounts of data
c) It reduces power consumption
d) It enhances voice recognition

(xiv) Which programming language is widely used for AI and robotics?
a) Java
b) C++
c) Python
d) HTML

(xv) What is the purpose of reinforcement learning in AI?
a) To manually program responses
b) To allow machines to learn from experience through rewards and penalties
c) To store large amounts of data
d) To encode security algorithms

(xvi) Which AI concept involves machines understanding and processing human language?
a) Neural networks
b) Computer vision
c) Natural Language Processing (NLP)
d) Deep learning

(xvii) What is the main function of an exoskeleton robot?
a) Assisting human movement
b) Replacing human workers
c) Detecting environmental hazards
d) Operating industrial machinery

(xviii) What is the term for robots that explore hazardous environments like nuclear sites?
a) Industrial robots
b) Service robots
c) Exploratory robots
d) Autonomous drones

(xix) Which ethical concern is most associated with AI and robotics?
a) Increased entertainment options
b) Job displacement
c) Energy consumption
d) Wearable technology

(xx) What does an accelerometer measure in a robot?
a) Temperature changes
b) Orientation and motion
c) Battery power
d) Network speed

Question 2

Answer the following questions:

1. List two applications of Artificial Intelligence in daily life. [2]
2. Explain the role of sensors in autonomous vehicles. [2]
3. Define Internet of Things (IoT) and mention one example of its use in smart homes. [2]
4. What is a microcontroller, and how is it used in robotics? [2]
5. Write the output of the following Python code: [2]

```
numbers = [1, 2, 3, 4, 5]
print(numbers[-2])
```

6. Write the output of the following Python code: [2]

```
message = "Artificial Intelligence"
print(message[:10])
```

7. Mention two key differences between supervised and unsupervised learning. [2]
8. What is edge computing, and why is it important in AI-powered robotics? [2]
9. Explain the function of a PID controller in robotics. [2]
10. What does the term "bias" mean in machine learning models, and how can it impact predictions? [2]

SECTION B

(Answer any four questions from this Section.)

Question 3

(i) How do warehouse robots improve logistics and inventory management? Provide two specific examples. [3]

(ii) What are the main differences between human decision-making and AI-based decision-making? [3]

(iii) Write a Python program to plot a bar graph using the Matplotlib library. Your program should: [9]

1. Import the necessary libraries.
2. Create lists of categories and their corresponding values.
3. Plot the bar graph with appropriate labels and a title

Question 4

(i) Differentiate between industrial robots and service robots. Why are service robots considered more flexible for dynamic environments? [3]

(ii) Explain the stages of an AI-based image recognition project using an example of face detection. [3]

(iii) Write a user-defined function isPrime() to accept a number and return True if the number is prime; otherwise, return False. (A number is prime if it is greater than 1 and has only two factors: 1 and itself.) [9]

Question 5

(i) What is the role of sensors in robotics? Differentiate between active and passive sensors with examples. [3]

(ii) List three major challenges in ensuring fairness and transparency in AI-driven decision-making. [3]

(iii) A water delivery service charges based on the number of liters delivered, according to the following criteria: [9]

Liter	**Price per liter (Rs)**
Up to 10	15/liter
11 - 20	12/liter
Above 20	10/liter

Write a Python program to calculate the total cost based on the amount of water delivered.

Question 6

(i) Describe the role of simulation software in robotics design. How does it help in testing robotic movements before physical implementation? [3]

(ii) What is malware? Explain how ransom ware attacks can compromise data security and list two preventive measures. [3]

(iii) Write a Python program that performs the following operations on a list of integers: [9]
Create a list of integers: [10, 20, 30, 40, 50].

1. Append the integer 60 to the list.
2. Insert the integer 25 at index 2.
3. Sort the list in descending order.
4. Find the minimum value in the list and print it.
5. Print the final list.

Question 7

(i) Explain the importance of integrating power supply, communication systems, and computational units in a robotic system. How do they work together to ensure smooth operation? [3]

(ii) Why is data pre-processing crucial in an AI project? Discuss how proper data cleaning and preparation enhance model performance. [3]

(iii) Write a Python program that performs the following operations on a tuple: [9]

1. Create a tuple with the elements: (5, 10, 15, 20, 25).
2. Access and print the element at index 2.
3. Convert the tuple into a list.
4. Remove the integer 15 from the list.
5. Convert the list back into a tuple.
6. Print the final tuple.

Question 8

(i) Explain the process of constructing a basic robotic arm. What are the key components involved in its design and operation? [3]

(ii) List and briefly describe three different types of charts commonly used for data visualization. [3]

(iii) Write a Python program that performs the following operations on a string: [9]

1. Create a string with the value "Artificial Intelligence".
2. Convert the entire string to uppercase and print the result.
3. Find and print the position of the substring "Intelligence" within the string.
4. Replace the substring "Artificial" with "Machine" and print the new string.
5. Check if the string starts with "AI" and print the result (True/False).
6. Count and print the number of occurrences of the letter 'i' in the string.

ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER: 4

ROBOTICS AND ARTIFICIAL INTELLIGENCE

Maximum Marks: ***100***

Time allowed: ***Two hours***

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Attempt ***all*** *questions from* ***Section A*** *and* ***any four*** *questions from* ***Section B.***

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SECTION A

(Attempt all questions.)

Question 1 [20]

(i) Which component provides movement to a robot?
   a) Sensor
   b) Actuator
   c) Controller
   d) Microprocessor

(ii) What is the primary function of a microcontroller in a robot?
   a) Detecting obstacles
   b) Controlling the robot's operations
   c) Supplying power
   d) Measuring distance

(iii) What type of sensor is commonly used for object detection in robots?
   a) Temperature sensor
   b) Ultrasonic sensor

c) Gyroscope
d) Barometer

(iv) What is an important characteristic of an autonomous robot?
a) Requires human intervention for movement
b) Operates independently without direct control
c) Works only in industrial environments
d) Uses only wired power sources

(v) Which of the following is an example of a mobile robot?
a) CNC machine
b) Drone
c) Traffic signal system
d) Industrial conveyor belt

(vi) What is the function of a gyroscope in a robot?
a) Measuring speed
b) Detecting rotation and orientation
c) Providing power
d) Enhancing image resolution

(vii) What does a robot's "kinematics" refer to?
a) Its power source
b) Its movement and motion capabilities
c) Its communication protocol
d) Its software programming

(viii) Which of the following robots is commonly used for industrial assembly lines?
a) Autonomous drone
b) SCARA robot
c) Humanoid robot
d) Military robot

(ix) What is the primary function of a robotic gripper?
a) Generating movement
b) Holding and manipulating objects
c) Navigating through obstacles
d) Providing sensory input

(x) Which component is essential for vision-based navigation in robots?
a) GPS module
b) Camera or vision sensor
c) Battery pack
d) DC motor

(xi) What type of AI allows robots to improve performance over time?
a) Supervised learning
b) Unsupervised learning
c) Machine learning
d) Reinforcement learning

(xii) Which sensor helps robots detect changes in light intensity?
a) LDR (Light Dependent Resistor)
b) Accelerometer
c) Gyroscope
d) Infrared sensor

(xiii) What is the role of computer vision in robotics?
a) Storing digital files
b) Helping robots analyze and interpret visual data
c) Controlling robotic arms
d) Providing power to the robot

(xiv) What does the acronym "ROS" stand for in robotics?
a) Robotic Operating System
b) Remote Object Sensor
c) Reactive Optical System
d) Robot Oriented Structure

(xv) Which AI approach enables a robot to make decisions based on previous experiences?
a) Rule-based AI

b) Heuristic AI
c) Machine learning
d) Reactive AI

(xvi) What is the primary use of SLAM (Simultaneous Localization and Mapping) in robotics?
a) Mapping and navigating environments
b) Increasing battery efficiency
c) Controlling robotic arms
d) Enhancing AI decision-making

(xvii) What is an essential feature of a cobot (collaborative robot)?
a) Works in hazardous environments
b) Functions independently without human interaction
c) Works alongside humans safely
d) Requires a continuous power supply

(xviii) Which of the following is a humanoid robot?
a) Roomba
b) Boston Dynamics' Atlas
c) Industrial robotic arm
d) SCARA robot

(xix) What is the role of a feedback loop in robotic control systems?
a) Sending real-time data for adjustments
b) Storing user preferences
c) Providing additional power
d) Reducing robotic movement

(xx) Which of the following technologies helps robots understand spoken commands?
a) Natural Language Processing (NLP)
b) Image Processing
c) Cloud Computing
d) Computer Vision

Question 2

Answer the following questions:

1. List two advantages of using robotic vacuum cleaners in smart homes. [2]
2. Mention two ways in which AI-powered robots can enhance workplace efficiency. [2]
3. Explain the function of actuators in robotic systems. [2]
4. Differentiate between Hardware and Software in the context of robotics. [2]
5. Outline the main stages involved in the AI project cycle. [2]
6. What is the Loebner Prize, and how is it related to the Turing Test? [2]
7. Define the term "Data Pre-processing" in machine learning. [2]
8. Predict the output of the following code:

```
numbers = [5, 10, 15, 20, 25]
print("The number is", numbers[1])
```
[2]

9. Predict the output of the following NumPy code:

```
import numpy as np
array = np.array([10, 20, 30, 40, 50])
print(array[-1])
```
[2]

10. Predict the output of the following string slicing code:

```
text = "Artificial Intelligence"
print(text[:9])
```
[2]

SECTION B

(Answer any four questions from this Section.)

Question 3

(i) How do robotics and AI enhance elderly care? Provide two specific examples. [3]
(ii) What are the key differences between human intuition-based decision-making and AI-driven decision-making? [3]
(iii) Write a Python program to generate a line plot using the Matplotlib library. Your program should: [9]
1. Import the necessary libraries.

2. Create two lists representing the x and y values.
3. Plot a line graph with appropriate labels and a title.

Question 4

(i) Compare traditional industrial robots with autonomous mobile robots (AMRs). Why are AMRs considered more flexible in modern industries? [3]

(ii) Describe the steps involved in a computer vision-based AI project using the example of facial recognition. [3]

(iii) Write a Python function isEven() that accepts a number and returns True if the number is even, otherwise False. [9]

Question 5

(i) Explain the role of actuators in robotics. Differentiate between electric and hydraulic actuators with examples. [3]

(ii) List three ethical concerns related to AI in decision-making. [3]

(iii) A parking system charges fees based on the number of hours a vehicle is parked, following this criteria:

Hours Parked	**Charge per Hour**
First 2 hours	Rs. 20
Next 3 hours	Rs. 15
Beyond 5 hours	Rs. 10

Write a Python program that takes the number of hours parked as input and calculates the total parking fee.

Question 6

(i) Explain the use of Tinker Cad in designing robotic components. What are the benefits of simulating robotic movements in Tinker Cad? [3]

(ii) How does phishing contribute to data breaches, and what preventive measures can be taken to protect against phishing attacks? [3]

(iii) Write a Python program that performs the following operations on a list of names: [9]

a. Create a list of names: ["Alice", "Bob", "Charlie", "David"]
b. Append "Eve" to the list.
c. Insert "Zara" at index 1.
d. Sort the list alphabetically.
e. Search for "Charlie" in the list and print its index.
f. Print the final list.

Question 7

(i) Explain the role of integrating power supply, communication modules, and software in a robotic system. How does their coordination enhance robotic functionality? [3]

(ii) Why is data pre-processing important in an AI project? How does it influence the accuracy and performance of the AI model? [3]

(iii) Write a Python program that performs the following operations on a set: [9]

1. Create a set with the elements {2, 4, 6, 8, 10}.
2. Add the element 12 to the set.
3. Remove the element 4 from the set.
4. Check if 6 is present in the set and print the result.
5. Print the final set.

Question 8

(i) Explain the process of assembling a basic robotic arm and list the essential components required for its functioning. [3]

(ii) Identify and briefly describe three different types of charts commonly used for data visualization. [3]

(iii) Write a Python program that performs the following operations on a given string: [9]

1. Create a string with the value "Machine Learning".

2. Convert the string to lowercase and print the result.
3. Find and print the position of the substring "Learning" within the string.
4. Replace the substring "Machine" with "Deep" and print the new string.
5. Check if the string ends with "Learning" and print the result (True/False).
6. Count and print the number of occurrences of the letter 'a' in the string.

ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER: 5

ROBOTICS AND ARTIFICIAL INTELLIGENCE

Maximum Marks: ***100***

Time allowed: ***Two hours***

Answers to this Paper must be written on the paper provided separately.

You will ***not*** *be allowed to write during the first* ***15*** *minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

Attempt ***all*** *questions from* ***Section A*** *and* ***any four*** *questions from* ***Section B.***

The intended marks for questions or parts of questions are given in brackets[ ].

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

SECTION A

(Attempt all questions.)

Question 1 [20]

Choose the correct answers to the questions from the given options.

(i) Which component is responsible for processing data and making decisions in a robot?
   a) Actuator
   b) Sensor
   c) Controller
   d) Power supply

(ii) What is the main function of an actuator in a robotic system?
   a) Detect environmental changes
   b) Convert electrical signals into physical movement

c) Store programming data
d) Process information

(iii) Which of the following is an example of an autonomous robot?
a) A remote-controlled drone
b) A self-driving car
c) A robot controlled by a joystick
d) A simple mechanical arm

(iv) Which type of sensor is used to detect obstacles in robots?
a) Temperature sensor
b) Ultrasonic sensor
c) Gyroscope
d) Accelerometer

(v) Which robotic component is responsible for interacting with the environment?
a) Sensor
b) End effector
c) Controller
d) Microprocessor

(vi) Which of the following robots is used for space exploration?
a) Humanoid robot
b) Mars rover
c) Industrial robot
d) Service robot

(vii) Which AI technique enables robots to recognize images and objects?
a) Natural Language Processing (NLP)
b) Computer Vision
c) Reinforcement Learning
d) Data Mining

(viii) What is the primary function of a gyroscope in a robot?
a) Measure rotation and balance
b) Detect obstacles
c) Control speed
d) Store energy

(ix) Which of the following is an application of AI in daily life?
a) Smart home assistants like Alexa
b) Manual typewriters
c) Traditional wristwatches
d) Hand calculators

(x) What does an AI chatbots primarily do?
a) Converts speech into text
b) Simulates human conversation
c) Creates video animations
d) Controls robot movements

(xi) What is the role of LiDAR in autonomous vehicles?
a) Mapping and navigation
b) Measuring temperature
c) Detecting weight
d) Tracking battery usage

(xii) Which of the following is an example of supervised learning?
a) A robot learns to walk without any guidance
b) A machine is trained with labelled data
c) A chatbots generates random responses
d) A drone navigates using only trial and error

(xiii) Which term refers to the ability of a robot to determine its position in an environment?
a) Localization

b) Automation
c) Computer vision
d) Data processing

(xiv) Which type of robot is primarily used in manufacturing industries?
a) Humanoid robot
b) Industrial robot
c) Service robot
d) Social robot

(xv) What is the significance of the Turing Test in AI?
a) It measures the intelligence of a machine
b) It tests the battery life of robots
c) It evaluates robot speed
d) It determines sensor accuracy

(xvi) Which factor is essential for robots to make decisions independently?
a) Predefined scripts
b) Sensor data processing
c) Remote control operation
d) Mechanical structure

(xvii) Which of the following robots assist disabled individuals in mobility?
a) Industrial robots
b) Exoskeleton robots
c) Military robots
d) Service robots

(xviii) What is the main role of AI in healthcare robotics?
a) Entertainment and gaming
b) Performing surgeries and assisting doctors
c) Enhancing social media interaction
d) Managing home appliances

(xix) Which term refers to robots that operate without continuous human input?
a) Remote-controlled robots
b) Autonomous robots
c) Humanoid robots
d) Industrial robots

(xx) What does an accelerometer measure in a robotic system?
a) Speed and movement
b) Battery voltage
c) Camera resolution
d) Heat levels

Question 2

Answer the following questions:

1. List two applications of robotics in manufacturing. [2]
2. Explain how sensors are used in a robot's navigation system. [2]
3. Define Machine Learning and mention one example of its use in robotics. [2]
4. What is an actuator in robotics, and how does it contribute to a robot's movement? [2]
5. Write the output of the following Python code: [2]

```
numbers = [10, 20, 30, 40, 50]
print(numbers[2])
```

6. Write the output of the following Python code: [2]

```
message = "Robotics and AI"
print(message[4:10])
```

7. Mention two key differences between supervised and reinforcement learning. [2]
8. What is edge AI, and why is it useful in autonomous robots? [2]

9. Explain the role of computer vision in robotics. [2]
10. What does the term "over fitting" mean in machine learning, and why is it problematic? [2]

SECTION B

(Answer any four questions from this Section.)

Question 3

1. How do autonomous mobile robots (AMRs) improve operational efficiency in warehouses? Provide two specific examples. [3]
2. What are the key differences between decision making based on experience and decision making based on algorithms in robots? [3]
3. Write a Python program to plot a scatter plot using the Matplotlib library. Your program should: [9]
    1. Import the necessary libraries.
    2. Create a list of data points for the X and Y axes.
    3. Plot the scatter plot with appropriate labels and a title.

Question 4

1. Explain the key differences between autonomous robots and human-robot collaboration systems. Why collaborative systems are considered more suitable for tasks requiring flexibility? [3]
2. Describe the steps involved in a machine learning project using the example of recognizing handwritten digits. [3]
3. Create a user-defined function `factorial(n)` to accept a number and return the factorial of that number. (A number's factorial is the product of all positive integers less than or equal to that number.) [9]

Question 5

1. Define the role of actuators in robotics. Differentiate between linear and rotary actuators with examples. [3]
2. List three challenges related to data privacy in artificial intelligence systems. [3]
3. A store charges a discount based on the total purchase amount. According to the following criteria: [9]
    - Purchase amount up to Rs. 500: No discount
    - Rs. 501 to Rs. 1000: 10% discount
    - Above Rs. 1000: 20% discount

      Write a program to enter the total purchase amount and calculate the discount to be applied.

Question 6

1. Explain the use of 3D printing in designing robotic components. What are the advantages of rapid prototyping in robotics? [3]
2. Describe how phishing attacks can lead to identity theft and suggest methods to protect against such attacks. [3]
3. Write a Python program that performs the following operations on a list of integers: [9]
    1. Create a list of integers: [5, 15, 25, 35, 45].
    2. Add the integer 55 to the list.
    3. Remove the integer 25 from the list.
    4. Reverse the list.
    5. Find the largest integer in the list and print it.
    6. Print the final list. [3]

Question 7

1. Describe how sensors, actuators, and controllers work together to enable a robot to perform tasks. [3]
2. What is the importance of defining the scope of an AI project? How does it influence the design and development process? [3]
3. Write a Python program that performs the following operations on a tuple: [9]
    1. Create a tuple with the elements: (5, 15, 25, 35, 45).
    2. Access and print the element at index 1.
    3. Convert the tuple into a list.
    4. Add the integer 50 to the list.
    5. Convert the list back into a tuple.
    6. Print the final tuple.

Question 8

1. Explain the process of designing a basic robot with wheels, and mention the essential components needed for construction. [3]
2. Identify and explain three methods of visually representing data, with examples. [3]
3. Write a Python program that performs the following operations on a string: [9]
    1. Create a string with the value "Robotics and AI".
    2. Convert the entire string to lowercase and print the result.
    3. Find and print the position of the substring "AI" within the string.
    4. Replace the substring "Robotics" with "Automation" and print the new string.
    5. Check if the string ends with "AI" and print the result (True/False).
    6. Count and print the number of occurrences of the letter 'o' in the string.