2024

SPECIMEN PAPERS

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CLASS IX

SPECIMEN QUESTION PAPER

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.

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*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[].

SECTION A (40 Marks)

*(Attempt **all** questions.)*

Question 1 [20]

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

(Do not copy the question, write the correct answers only.)

(i) Name the application of Computer vision depicted in the above picture.



(a) Visual Navigation

(b) Augmented Reality

(c) 3D Reconstruction

(d) Panorama Stitching

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(ii) A college student created a fake picture of his fellow student using AI's deepfake technology registered for a competition on photography.

Which ethical issue is related to this?

(a) Automation and impact over jobs

(b) Trust, privacy and control

(c) Bias and Fairness

(d) Transparency

(iii) Layers of a neural network is divided into several blocks are called:

(a) Neurons

(b) Dataset

(c) Nodes

(d) Axons

(iv) _____ makes use of past data to solve a problem with the help of statistical methods and trained algorithm models.

(a) Machine Learning

(b) Data Science

(c) Computer Vision

(d) Deep Learning

(v) Which of the following is **not** an advantage of using robots?

(a) Robots can do the same repetitive tasks with the same precision over an extended time.

(b) Without harming businesses or their personnel, automated robots may be developed and used in any situation.

(c) Robotic automation frees the workers from tedious, monotonous work.

(d) Robotic automation do repeated jobs less effectively than humans.

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(vi) The "Three Laws of Robotics" are a set of rules devised by:

(a) Roger MacBride Allen

(b) Isaac Asimov

(c) Marvin Minisky

(d) Ismail al-Jazari

(vii) Tricopter is:

(a) Multi rotor drone

(b) Hybrid VTOL

(c) Single rotor drone

(d) Wheeled robot

(viii) _____ acts as the brain of the robot, directing its movements and behavior.

(a) Sensor

(b) Controller

(c) Encoder

(d) Actuator

(ix) _____ are the type of robots which uses caterpillar tracks instead of wheels.

(a) Legged Robots

(b) Tracked Robots

(c) Caterpillar Robots

(d) None of these

(x) Your data footprint refers to:

(a) The data trail left by you when you surf the internet.

(b) The number of electronics goods you buy in a year.

(c) The number of apps you have on your mobile.

(d) The time you spend on computer.

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(xi) An escape sequence is represented by a _____ followed by one or more characters.

(a) \

(b) ' '

(c) \\

(d) !

(xii) Which of the following is an example of a deterministic problem?

(a) Selecting a card from a deck of cards.

(b) Solving a system of linear equation.

(c) Rolling a dice.

(d) Flipping a coin.

(xiii) Self driving cars learn to behave in an environment by performing the actions and seeing the result of actions. This type of learning is called:

(a) Supervised learning

(b) Unsupervised learning

(c) Reinforced learning

(d) Deep learning

(xiv) These sensors are used to give robots a way to prevent collisions:

(a) Light sensor

(b) Proximity sensor

(c) Ultrasonic sensor

(d) Infrared sensor

(xv) print (not 15<10 or 2 **3>12/3) would result in:

(a) True

(b) False

(c) true

(d) false

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(xvi) Identify the operators:

1. and
2. %
3. >=

(a) 1. Logical 2. Arithmetic 3. Relational

(b) 1. Logical 2. Relational 3. Arithmetic

(c) 1. Relational 2. Arithmetic 3. Logical

(d) 1. Arithmetic 2. Logical 3. Relational

(xvii) **Assertion (A) :** AI refers to the ability of machine to perform cognitive tasks.

Reason (R) : Machine Learning is a subset of AI.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is not a correct explanation of Assertion(A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion(A)

(c) Assertion (A) is true and Reason (R) is false

(d) Assertion (A) is false and Reason (R) is true

(xviii) Read the following text, and choose the correct answer:

Python is a general-purpose, object oriented, easy to learn and high-level programing language. Guido van Rossum designed Python and released it in 1991. He wants to give a unique name to it so he named it after the famous BBC comedy TV show "Monty Python's Flying Circus".

What does Object Oriented mean?

(a) High level and general purpose programing language.

(b) Supports the concept of classes and objects that makes its code efficient and reusable.

(c) Program supports GUI which makes it more user friendly.

(d) Supports multiple platforms.

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(xix) **Assertion (A):** A robot is considered a machine, not a computer.

Reason (R) : The computer gives the machine its intelligence and its ability to perform tasks.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is not a correct explanation of Assertion(A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion(A)

(c) Assertion (A) is true and Reason (R) is false

(d) Assertion (A) is false and Reason (R) is true

(xx) Sophia is a humanoid robot who is the first _____.

(a) Robot alien

(b) Robot writer

(c) Robot artist

(d) Robot citizen

Question 2

Answer the following questions:

(i) Army robots or the military robots are typically unmanned ground vehicle (UGV) - robots that come equipped with wheels or legs. These are extensive applications of AI based technology that can be introduced in defence sector. Mention *any two* such areas of applications. [2]

(ii) Describe *two* different types of motions involved in construction of a robot. [2]

(iii) India is becoming a global hub for AI. Our country among top listed nations that has achieved millions of funding for tech based start-ups. With reference to this, mention *two* advantages of AI. [2]

(iv) State *one* difference between artificial intelligence and machine learning. [2]

(v) (a) Mention *any one* area when 4 degrees of freedom Robotics arm is used. [2]

(b) A software that replies to queries instantly is known as Chatbot. True or False?

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(vi) What will be the output from the code given below: [2]

```
p, q, r = 4, 8, 10
q, p, r = q - 2, p - 2, r - 2
print (p, q, r)
```

(vii) Mr. X executes the following program segment and the answer displayed is an error. Name the error. How the program can be modified to get the correct answer? [2]

```
A=9
S='Universe'
S1=S+A
print(S1)
```

(viii) How many times will the following loop execute? What will be the output? [2]

```
i = 10
while i < 50:
    i += 10
    if i < 30:
        print(i)
```

(ix) Predict the output of the following code: [2]

```
x=True
y=False
if not x or y:
        print("Hi")
else:
        print("Bye")
```

(x) Write the output of the following code: [2]

```
x = ["Break a leg", "Good Luck", "Best Wishes"]
print(x)
print(type(x))
```

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SECTION B (60 Marks)

*(Answer **any four** questions from this Section.)*

The answers in this section should consist of the programs in either python environment or any program environment with python as the base.

Each program should be written using variable description / mnemonic codes so that the logic of the program is clearly depicted.

Flowcharts and algorithms are not required.

Question 3

(i) Draw the block diagram of a typical robotic mechanical system. [3]

(ii) This field of Artificial Intelligence enables computers and systems to derive meaningful information from digital images. [3]

(a) Name the technology used here.

(b) Mention two applications of this technology.

(iii) XYZ shop is offering a discount on a mobile as per given below: [9]

Price	Discount
upto ₹ 10000/-	15%
₹ 10000 to ₹ 20000/-	20%
Above ₹ 20000/-	30%

Write a python program to accept the price(P) of a mobile from user, calculate the Discount(D) based on the above criteria and print the payable amount(P-D) after availing discount.

Question 4

(i) Write the categories of Drones. Explain *any one*. [3]

(ii) The Principal of your school has decided to convert your school into a smart school. Discuss *any three* benefits of a smart school. [3]

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(iii) Write a program to accept a symbol from the user and draw the following pattern containing that symbol. [9]

Example 1:

Input: Enter the symbol: @

Output:

@ @ @ @

@ @ @

@ @

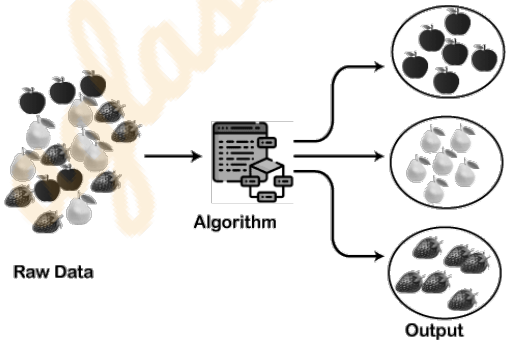
@

Question 5

(i) Robot algorithm refer to a set of instructions that are designed to enable a robot to perform specific tasks or operations. It can be broadly categorized into two main types. [3]

Name the *two* types of algorithm involved herewith. Hence define each type.

(ii) Based on the picture given below, answer the following questions: [3]



(a) Identify the type of AI model.

(b) Explain the model in brief.

(iii) Create a user defined function to accept the three sides of a triangle and print the type of the triangle [Scalene / Isosceles / Equilateral] (An equilateral triangle has sides that are all equal. An isosceles triangle has two sides that are identical. In a scalene triangle, all the sides are unique.) [9]

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Example:

Input: Enter the first side : 5
Enter the second side : 8
Enter the third side : 5

Output: Isosceles triangle

Question 6

(i) To create a specific motion in a robot, links and joints are used to construct the robot's kinematic chain. Define the kinematic chain and mention the steps to be followed to create a specific motion in a robot. [3]

(ii) As more and more new technologies get into play; risks will get more concentrated into a common network. Cyber security becomes extremely complicated in such scenarios and goes beyond the control of firewalls. It will not be able to detect unusual activity and patterns including the movement of data. Discuss the above problem with the 4W canvas. [3]

(a) Who has the problem?

(b) What is nature of problem?

(c) Where does the problem arise?

(d) Why do you think it is a problem worth solving?

(iii) Write a menu-driven python program to do the following: [9]

(a) Accept any two digits (0 – 9) from user, and form all possible numbers with those digits.

Example:

Input: Enter the first digit: 5
Enter the second digit: 8

Output: 58, 85 ,55 and 88 .

(b) Accept a distance in metre from user, then convert to kilometre and metre.

Example:

Input: 2404 km

Output: 2 km 404 m

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Question 7

(i) If a human told the robot to attack another human, the robot wouldn't comply, but if the human told the robot to disassemble itself, the robot would comply. Explain this robot's behaviour referring the Law of Robotics. [3]

(ii) Draw the circuit diagram and write truth table for the NAND gate. [3]

(iii) Write a python program to accept a number n to calculate and display the sum of the series: $s = 1 + \frac{1}{3} + \frac{1}{5} + \frac{1}{7}$ ……..n terms [9]

Example:

Input: Enter the no. of terms(n) in series: 3

Output: 1.533333……

Question 8

(i) Define degrees of freedom. Mention any two types of degrees of freedom. [3]

(ii) A fully automatic washing machine is not Artificial Intelligence enabled. True or False. Justify your answer. [3]

(iii) Write a python program that accepts principal (P), rate of interest(R), time(N) and then calculate Compound Interest(CI) where $CI = A - P$ [9]

$$A = P\left[\left(1 + \frac{R}{100}\right)^{N}\right]$$

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