DELHI PUBLIC SCHOOL NEWTOWN

SESSION: 2024-2025

HALF YEARLY EXAMINATION

CLASS: IX **FULL MARKS: 100**

SUBJECT: ROBOTICS & AI [SET A] **TIME: 2 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 reading the question paper.
***The time given at the head of this Paper is the time allowed for writing the answers**.*

*This paper consists of **six** printed pages. This Paper is divided into two Sections.*
*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 [].

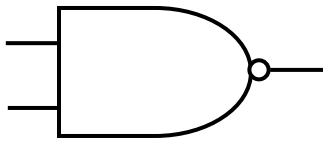
SECTION A (40 Marks)

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

Question 1

Choose the correct answers to the questions from the given options. [20]

(i) Name the **conditional gate** depicted in the given image.



(a) NOT
(b) NAND
(c) NOR
(d) AND

(ii) Which of the following is **not** an autonomous robot?
(a) A self-driven robot used for underwater life monitoring and research.
(b) A warehouse robot used for shifting products using navigation sensor.
(c) A robot used in medicine for rehabilitation therapy.
(d) The Mars rover is designed to explore the surface of Mars.

(iii) Who proposed the Turing Test in 1950?
(a) Isaac Turing
(b) Alan Turing
(c) Adil Tudyk
(d) Alan Tudyk

(iv) Which of the following is the correct sequence to create multiple conditional statement?

(a) if else
(b) if elif else
(c) if else if
(d) if else elif

(v) **Assertion(A):** AI is integrated into car driver-assistance system to improve safety.
Reason (R): These systems include adaptive cruise control and collision avoidance.

(a) Both Assertion (A) and Reason (R) are true, and Reason (R) is not the 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.

(vi) Which type of actuator would be required for **lightweight** applications?

(a) Electric Actuators
(b) Hydraulic Actuators
(c) Pneumatic Actuators
(d) Piezoelectric Actuators

(vii) "A robot is designed to operate in harsh environments".
Which characteristic defines this feature?

(a) Durability
(b) Autonomy
(c) Adaptability
(d) Accuracy

(viii) If an identifier has **type (): <class 'list'>,** with 7 elements, what will be the range of its index positions?

(a) 1 – 7 (b) 0 – 7 (c) 1 - 6 (d) 0 – 6

(ix) Which era in AI evolution is also termed as AI Winter?

(a) When various machine learning methodologies came into existence.
(b) During when the concept of deep learning gained popularity.
(c) During recession in AI technology.
(d) When the development of Expert Systems took place.

(x) _____ is an identity operator in Python.

(a) in (b) is (c) not (d) or

(xi) Which building block of a robot controls the hands, legs and body movements?

(a) Actuators
(b) Manipulators
(c) Controllers
(d) Communication System

(xii) _____ is an important application of Artificial Intelligence in transport.

(a) Maintenance prediction (c) Content Generation

(b) Fraud detection (d) Cyber Security

(xiii) **Statement 1:** "The average monthly sales for the first quarter of 2022 is 175 units."
Statement 2: "The product launch dates are January 1st, and July 21st, 2022."

(a) Both Statement 1 and Statement 2 are information.

(b) Both Statement 1 and Statement 2 are data.

(c) Statement 1 is information and Statement 2 is data.

(d) Statement 1 is data and Statement 2 is information.

(xiv) _____ is a keyword which is a null statement used as a placeholder and makes the code syntactically executable.

(a) continue (c) break

(b) pass (d) exit

(xv) Which cannot be considered as a limitation of Deterministic Computing?

(a) Rigidness (c) Handling incomplete data

(b) Complex problem (d) Reasoning Capability

(xvi) What will be the output for the following Python code:

```
val='Enjoy Coding'
chk='A'
while chk in val:
    print(chk)
```

(a) Syntax Error (b) No Output (c) Infinite Loop (d) AAAAAAAAAA

(xvii) What will be the outcome of Python code**: >>> print ('5'**3)**

(a) '555' (b) 125 (c) '15' (d) Error

(xviii) Which of the following is not a valid error in Python?

(a) Linking error (c) Logical Error

(b) Syntax error (d) All are valid

(xix) Which of the following is **not true** for *range( )* function?

(a) It requires up to three parameters.

(b) Generates a range of values including both upper and lower limits.

(c) The arguments must be integer.

(d) It must have a start, stop and step value.

(xx) Which is the correct syntax to define a **tuple**?

(a) tup = [1, 2, 3, 4]
(b) set1 =' 1, 2, 3, 4 '
(c) dict1 = (1, 2, 3 , '4')
(d) list1 = {1, 2, ' 3, 4 '}

Question 2

(i) Match the correct purpose of the given robots: [2]

(a) TaLos : "Recognizing emotions"
(b) Pepper : "Interacting with Humans"
(c) Sophia : "Acrobat Maneuver"
(d) iCub : "Fire Fighter"

(ii) India is becoming the global hub for AI and is using AI in multiple domains. Discuss any two points how AI is being used in **entertainment**. [2]

(iii) Based on the below Python code answer the questions:

```
print( z[0] ) if z[0] > z[1] else print( z[1] )
```

(a) Convert to its equivalent **if else** statement. [2]
(b) If z is defined as **z= [1, 2]**, what is the output? Show working. [2]
(c) Mention the datatype of the identifier. [1]
(d) Which function can be used to identify the datatype? Mention the syntax. [1]

(iv) After identifying the correct data, how does **survey** and **web scrapping** help while acquiring relevant data? [2]

(v) Predict the output: [2]

```
for num in range(12):
    if num % 2 == 1:
        continue
    if num > 9:
        break
    print(num)
```

(vi) Briefly discuss **any two** *forms of data* with an example. [2]

(vii) Discuss any **two** power sources that can be used to make a robot functional. [2]

(viii) Pratibha has structured a code using Python **Script mode**. Once the code is executed what will be the output? [2]

```
num = [ 5, 6, 1, 4 ]
a, b, c=num[0] + num[1], num[0] - num[3], num[2] ** 2
print(a, b, c)
print(type(a))
```

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) State the **three** Laws of Robotics and mention **who** created these laws. [3]

(ii) Discuss any **three** applications of AI in Medicine and Healthcare. [3]

(iii) Write a Python program that calculates and displays either Simple Interest or Compound Interest based on users' choice. The program should ask the user for Principal amount (P), Rate of interest per year (R), Time period in years (T) and Choice (Simple or Compound). [9]

Use the following formulas:

Simple Interest (SI): $SI = \frac{P \times R \times T}{100}$

Compound Interest (CI): $CI = P\left(1 + \frac{R}{100}\right)^{T}$

Question 4

(i) What is a mobile robot? Briefly discuss its two important design features. [3]

(ii) What do you understand by **Probabilistic** Computing? Give its **one** main characteristic and **one** example of probabilistic problems. [3]

(iii) Write a program to accept a number n to calculate and display the sum of series: [9]

$$S = \frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \cdots\cdots \frac{n}{n+1}$$

Sample Input: Enter the number of terms 5

Sample Output: 3.5500000000000003

Question 5

(i) How are **humanoid** robots different from **collaborative** robots? [2]

(ii) What do you understand by *ethics*? Discuss any **two** ethical issues in AI. [3]

(iii) Write a menu driven program, where the user enters a choice from the below mentioned menu and perform logical calculations to get desired results: - [10]

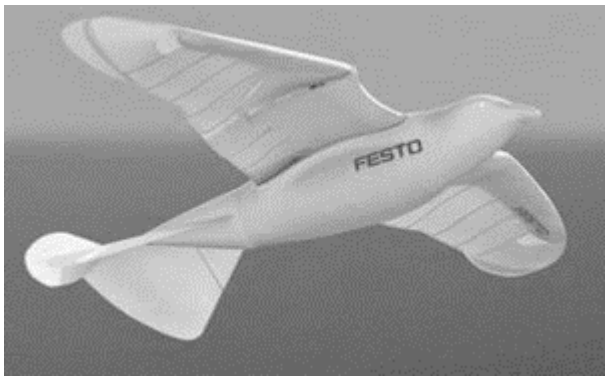
1. Accept a number and check if it is even or odd.
2. Accept a number, calculate and display its factorial.
3. Accept time in seconds and convert it in hours.

Sample Input: Enter a choice (1 or 2 or 3) 1
Enter a number for check 109

Sample Output: 109 is an odd number

Question 6

(i) Identify the robot shown below. Mention it's **two** *characteristics* and *applications*. [3]



(ii) Write the logical symbol, expression and truth table of conditional **OR gate**. [3]

(iii) Write a program to accept a string from the user and count and display the number of vowels and consonants present in the string. Assume the entered string does not include numbers or special symbols. [9]

Sample Input: Enter a Text- 'Telecommunication'
Sample Output: Vowels Count = 8
Consonants Count = 9

Question 7

(i) Classify Robots based on Field. Mention **one** application of each type. [3]

(ii) During Supply Chain Management, which computing technique would be more suitable? **Justify** your answer. [3]

(iii) Write a program to accept a degree [up to 180] and categorize its type based on the following classifications: [9]

- A degree that lies between 180 and 90 is called **obtuse** angle.
- A degree that is 90 is called a **right** angle.
- Any degree that lies between 0 to 90 is an **acute** angle.

Question 8

(i) What is the role of microcontroller? Mention its types. [3]

(ii) What do you understand by machine learning and deep learning? [2]

(iii) Write a program to accept the sales of a salesman. Calculate and display his total commission based on the sale value according to the following rates: [10]

Sales in ₹ (Indian Currency)	**Commission**
0 to 5000	5% on sale
5001 to 7000	7.5% on sale
Above 7000	10% on sale