FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION
H-8/4, ISLAMABAD

ASSESSMENT MANUAL FOR THEORY & PRACTICAL OF ARTIFICIAL INTELLIGENCE & ROBOTICS SSC-I (SCHEME OF STUDIES 2024)

FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION
H-8/4, ISLAMABAD

Artificial Intelligence & Robotics - Scheme of Studies 2024

Theory & Practical Paper Assessment (100 Marks)

Overall Assessment Division

The annual examination comprises 100 marks, with 40 marks allocated to the Theory Paper and 60 marks to the Practical component. Of the 22 SLOs in the Grade IX curriculum, 10 are assessed exclusively through theory, 7 exclusively through practical assessment, and the remaining 5 through both components. For SLOs assessed in both components, theoretical understanding is evaluated in the Theory Paper, while practical performance is assessed in the Practical component. The same evidence is not credited twice.

Component	Marks	Composition	Time allowed
Annual Theory Paper **Draws on 15 SLOs (10 theory-only + 05 dual).**	40	Section A: MCQs 8 × 1 = 08 Section B: Short Response Questions 10 × 2 = 20 Section C: Extended Response Questions 2 × 6 = 12	**2:30 hours**
Practical **Draws on 12 SLOs (07 practical-only + 05 dual).**	60	Hands-on practical skills = 20 Yearly project = 30 Viva voce = 10	**4 hours**
Total	**100**	22 unique SLOs — full Grade IX coverage.	

SLOs Categorization:

SR#	Theory Only	Practical Only	Dual (Theory + Practical)
1	AI-09-A-01	AI-09-A-03	AI-09-A-02
2	AI-09-A-04	AI-09-B-01	AI-09-B-03
3	AI-09-B-05	AI-09-B-02	AI-09-D-02
4	AI-09-E-01	AI-09-B-04	AI-09-E-05
5	AI-09-E-02	AI-09-C-01	AI-09-F-03
6	AI-09-E-03	AI-09-C-02	
7	AI-09-E-04	AI-09-D-01	
8	AI-09-F-01		
9	AI-09-F-02		
10	AI-09-F-04		

Federal Board SSC-I Examination
Model Question Paper Artificial Intelligence & Robotics
National Curriculum 2026 (Inclusive Scheme of Studies 2024)

Section - A (Marks 08)

Time Allowed: 15 minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. *Do not use lead pencil.*

ROLL NUMBER					
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Version No.			
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1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Candidate Sign._____ **Invigilator Sign. _____**

Q1. Fill the relevant bubble against each question according to curriculum. Each part carries one mark.

Sr. #	Question	A	B	C	D	A	B	C	D
i.	The primary purpose of the Laws of Robotics is to:	standardize how robots are manufactured	ensure robots behave safely around humans	increase the processing speed of robots	enable robots to learn from data	O	O	O	O
ii.	A professional who prepares datasets, finds patterns in them, and communicates insights is a:	machine learning engineer	database administrator	data scientist	data entry operator	O	O	O	O
iii.	In Exploratory Data Analysis, an outlier is a value that:	occurs most frequently in the data	lies exactly at the average	was removed during data cleaning	lies far from the general pattern of the data	O	O	O	O
iv.	In the Sense–Think–Act model, the "Think" stage corresponds to:	collecting data through sensors	processing information and deciding on an action	carrying out the action through actuators	transmitting data to other robots	O	O	O	O
v.	A smart thermostat differs from a simple timer mainly because it:	follows fixed rules set at installation	requires an internet connection to operate	adjusts its behavior using patterns learned from usage data	responds faster to changes in temperature	O	O	O	O
vi.	A face-recognition system trained mostly on images of one skin tone performs poorly on others. The most likely root cause is:	unrepresentative training data	too much variety in the training data	incorrect colour calibration of the camera	insufficient storage for the images	O	O	O	O
vii.	Under the Three Laws of Robotics, a robot ordered by a human to perform an action that would injure another human must:	obey, because the Second Law requires obedience	refuse, because the First Law overrides obedience	obey only if refusing would damage the robot	refuse only if the injury would be permanent	O	O	O	O
viii.	A delivery robot reroutes itself around an unexpected obstacle without any human input. The capability MOST directly responsible is:	control by a remote operator	playback of a pre-programmed fixed path	higher-torque wheel motors	AI-based autonomous decision-making	O	O	O	O

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THEORY MODEL QUESTION PAPER

ARTIFICIAL INTELLIGENCE & ROBOTICS

Time allowed: 2:15 Hours **Total Marks Sections B & C: 32**

SECTION – B (Marks 20)

Q2. Attempt the following questions. Each part carries TWO marks. (10 × 2 = 20)

Sr#	Question	OR	Question	Marks
(i)	State any two (02) challenges in ensuring that robots follow ethical and safety laws.	**OR**	Enlist any two (02) benefits that AI-driven robots bring to the healthcare industry.	2
(ii)	Name four job roles that use AI and robotics technologies.	**OR**	List four (04) areas that ethical guidelines for AI typically cover.	2
(iii)	What is meant by the "Sense" stage in the Sense-Think-Act model? Give one example.	**OR**	Name two (02) industries where AI-driven robots are used, giving one example of a robot for each.	2
(iv)	What is Exploratory Data Analysis (EDA)? Name any two (02) Python libraries commonly used for performing EDA.	**OR**	List four (04) emerging technologies that are likely to shape future smart homes.	2
(v)	Differentiate between an autonomous robot and a remote-controlled robot with examples.	**OR**	A supermarket uses an AI-powered robot to guide customers to products and manage inventory. State that how this robot can improve customer service.	2
(vi)	How a learning algorithm improves a smart home device over time. Give example.	**OR**	How can a scatter plot show whether two variables are related? Illustrate with a suitable example.	2
(vii)	A factory robot automatically stops when a worker enters its operating area. Briefly explain how this safety feature reflects the spirit of the Laws of Robotics.	**OR**	Why are rules governing robot behavior necessary? Give example.	2
(viii)	What is bias in AI? Illustrate with one suitable example.	**OR**	A person uses a voice assistant to set reminders and control home appliances. How does it make daily life more convenient?	2
(ix)	What are two (02) possible consequences for a company that develops AI systems without following ethical guidelines?	**OR**	How a dataset can still create privacy risks even after people's names have been removed from it?	2
(x)	What are the two (02) ethical considerations should a programmer consider when developing a delivery robot?	**OR**	State the Third Law of Robotics and give one example of its application.	2

SECTION – C (Marks 12)

Note: Attempt all questions. Marks of each question are given along with the question. (2 × 6 = 12)

Sr#	Question	OR	Question	Marks
Q. 3	A service robot receives an instruction from a person that could put another person in danger. Using Asimov's three (03) principles of robot behavior, explain how the robot should respond. Justify your answer with suitable examples.	**OR**	A company develops an AI system for hiring, customer data analysis, and workplace safety. Identify and explain the ethical concerns related to bias, privacy, and safety in these applications, giving one example of each.	6
Q. 4	An agricultural company plans to replace manual crop inspection with AI-powered autonomous drones. Apply the Sense–Think–Act model to describe how such a drone would operate in the field, and evaluate the plan by giving two benefits and two limitations the company should expect.	**OR**	A housing developer plans to introduce AI-enabled smart homes. Explain how learning algorithms can improve three home systems and justify three future smart-home innovations based on emerging technologies.	6

SLO Mapping of each question:

Question	Content Domain	SLO	Cognitive Level	Marks
SECTION A				
Q1-i	E: Robotic Components & Advanced Robotics	AI-09-E-01	Knowledge	1
Q1-ii	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-04	Knowledge	1
Q1-iii	D: Machine Learning & AI Algorithms	AI-09-D-02	Knowledge	1
Q1-iv	A: Fundamentals of AI & Robotics	AI-09-A-02	Understanding	1
Q1-v	B: Practical applications of AI & Robotics	AI-09-B-03	Understanding	1
Q1-vi	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-03	Understanding	1
Q1-vii	E: Robotic Components & Advanced Robotics	AI-09-E-02	Understanding	1
Q1-viii	A: Fundamentals of AI & Robotics	AI-09-A-01	Understanding	1
SECTION B				
Q2-i (f)	E: Robotic Components & Advanced Robotics	AI-09-E-03	Knowledge	2
Q2-i (s)	A: Fundamentals of AI & Robotics	AI-09-A-04	Knowledge	2
Q2-ii (f)	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-04	Knowledge	2
Q2-ii (s)	A: Fundamentals of AI & Robotics	AI-09-A-02	Knowledge	2
Q2-iii (f)	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-02	Knowledge	2
Q2-iii (s)	A: Fundamentals of AI & Robotics	AI-09-A-04	Understanding	2
Q2-iv (f)	D: Machine Learning & AI Algorithms	AI-09-D-02	Knowledge	2
Q2-iv (s)	B: Practical applications of AI & Robotics	AI-09-B-05	Knowledge	2
Q2-v (f)	A: Fundamentals of AI & Robotics	AI-09-A-01	Understanding	2
Q2-v (s)	A: Fundamentals of AI & Robotics	AI-09-A-04	Understanding	2
Q2-vi (f)	B: Practical applications of AI & Robotics	AI-09-B-03	Application	2
Q2-vi (s)	D: Machine Learning & AI Algorithms	AI-09-D-02	Application	2
Q2-vii (f)	E: Robotic Components & Advanced Robotics	AI-09-E-03	Understanding	2
Q2-vii (s)	E: Robotic Components & Advanced Robotics	AI-09-E-01	Understanding	2
Q2-viii (f)	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-03	Understanding	2
Q2-viii (s)	B: Practical applications of AI & Robotics	AI-09-B-02	Understanding	2
Q2-ix (f)	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-02	Knowledge	2
Q2-ix (s)	E: Robotic Components & Advanced Robotics	AI-09-E-05	Understanding	2
Q2-x (f)	F: Ethics, Laws & Careers in AI & Robotics	AI-09-F-03	Understanding	2
Q2-x (s)	E: Robotic Components & Advanced Robotics	AI-09-E-02	Understanding	2
SECTION C				
Q3 (f)	E: Robotic Components & Advanced Robotics	AI-09-E-02	Understanding	6
Q3 (s)	F: Ethics, Laws & Careers in AI & Robotics	AI-12-F-03	Understanding	6
Q4 (f)	A: Fundamentals of AI & Robotics	AI-09-A-02	Application	6
Q4 (s)	B: Practical applications of AI & Robotics	AI-09-B-05	Application	6

Table of Specifications (ToS) — Model Paper Artificial Intelligence & Robotics, Grade IX (SSC-I)

Content Domain / Cognitive Level	Domain A: Fundamentals of AI & Robotics	Domain B: Practical Applications of AI & Robotics	Domain D: Machine Learning & AI Algorithms	Domain E: Robotic Components & Advanced Robotics	Domain F: Ethics, Laws & Careers in AI & Robotics	Total Marks	%age of Cognitive Level
Knowledge (K)	Q2-i (s) (2) Q2-ii (s) (2)	Q2-iv (s) (2)	Q1-iii (1) Q2-iv (f) (2)	Q1-i (1) Q2-i (f) (2)	Q1-ii (1) Q2-ii (f) (2) Q2-iii (f) (2) Q2-ix (f) (2)	**19**	**26.4%**
Understanding (U)	Q1-iv (1) Q1-viii (1) Q2-iii (s) (2) Q2-v (f) (2) Q2-v (s) (2)	Q1-v (1) Q2-viii (s) (2)		Q1-vii (1) Q2-vii (f) (2) Q2-vii (s) (2) Q2-ix (s) (2) Q2-x (s) (2) Q3 (f) (6)	Q1-vi (1) Q2-viii (f) (2) Q2-x (f) (2) Q3 (s) (6)	**37**	**51.4%**
Application (A)	Q4 (f) (6)	Q2-vi (f) (2) Q4 (s) (6)	Q2-vi (s) (2)			**16**	**22.2%**
Total Marks	**18**	**13**	**5**	**18**	**18**	**72**	**100%**
Total %ages	**25%**	**18.1%**	**6.9%**	**25%**	**25%**	**100%**	

Note:

1 This ToS does not reflect policy, but it is particular to this model question paper.

2 Proportionate / equitable representation of the content areas as per the defined ranges may be ensured.

3 The percentage of cognitive level is 30%, 50%, and 20% for knowledge, understanding, and application, respectively with **± 5%** variation.

4 While selecting alternative questions for Short Response Questions (SRQs) and Extended Response Questions (ERQs), it must be kept in mind that:

- Difficulty levels of both questions should also be same
- SLOs of both the alternative questions must be different

Key:

Question Number (part/ first choice) marks example: **Q2-i (f /s) (2)**

Question Number (part/ second choice) marks example: **Q3 (f / s) (6)**

ASSESSMENT MANUAL FOR PRACTICAL

(60 MARKS)

Component	Maximum Marks
Hands-on Practical Skills	20
Yearly Project	30
Viva Voce	10
Total Practical Assessment	**60**

Hands-on Practical Skills (2 x 10 = 20 Marks)

Students shall perform two (02) practical tasks assigned by the external examiner.
Sample practical list includes:

No.	Practical description	Related SLO
1	Write a Python program that takes a student's name and marks in three subjects as input. Calculate and display the total marks and percentage.	AI-09-C-02
2	Write a Python program that takes room temperature as input. Use if-elif-else to display "Fan OFF", "Fan ON", or "AC ON" according to given temperature limits.	AI-09-C-02, AI-09-B-01
3	Store five light-sensor readings in a list. Use a loop to display each reading and show "Lights ON" when a reading is below a set value.	AI-09-C-02, AI-09-B-01
4	Write a Python function that converts temperature from Celsius to Fahrenheit. Call the function for three different values and display the results.	AI-09-C-01
5	Create a small Python module (e.g. home_utils.py) with two functions: one to check room temperature and one to check light level. Import the module into another program and use both functions.	AI-09-C-01
6	Write a Python program that follows the Sense-Think-Act model: input a distance value (Sense), decide using a condition (Think), and display "Move Forward" or "Stop" (Act). Label each step with comments.	AI-09-A-02
7	Use a teacher-provided image recognition tool (e.g. Teachable Machine) to recognize three classroom objects. Test each object several times and record correct and incorrect results.	AI-09-A-03
8	Write a Python program for a smart thermostat that stores the user's last five temperature settings in a list. Set and display the next temperature as their average to show how the device learns from habits.	AI-09-B-03
9	Write a Python program for a smart door lock that gives three attempts to enter the correct PIN. Display "Door Unlocked" for a correct PIN and "Alarm ON" after three wrong attempts.	AI-09-B-04
10	Write a Python program that checks whether a smart-device password is strong (at least 8 characters and contains a digit). Test five passwords and display "Strong" or "Weak".	AI-09-B-04, AI-09-F-03
11	Use teacher-provided daily usage hours of home devices (fan, lights, TV, mobile phone). Write a program to find the total hours and the most-used device, and suggest one way to save energy.	AI-09-B-02

No.	Practical description	Related SLO
12	Load a small teacher-provided CSV file using pandas. Display the first five rows, find missing values and duplicate rows, then fill or remove them and save the cleaned file.	AI-09-D-01
13	Draw a line graph of one week's temperature readings using matplotlib, with a title and axis labels. Identify the hottest and coldest day from the graph.	AI-09-D-02
14	Use seaborn or matplotlib to draw a bar chart showing the number of records in each category of a supplied dataset. State whether the dataset is balanced and how an unbalanced dataset can cause bias.	AI-09-D-02, AI-09-F-03
15	Write a Python program for a simulated delivery robot that stops when a person is closer than a safe distance, even if a "move" command is given. Explain the safety rule used.	AI-09-E-05, AI-09-F-03

Assessment Criteria of Hands-on practical skills:

Criterion	Marks
Implementation Follows correct steps and uses suitable programming concepts or simulation tools.	**5**
Output Runs the program or simulation and produces the required output.	**3**
Testing and Observations Tests different inputs or settings and records observations.	**2**

The practical examination shall be assessed according to the prescribed practical tasks and the student's demonstrated performance.

Yearly Project (30 Marks)

Description

Design, implement, and demonstrate a small AI and Robotics project that solves a simple everyday problem (e.g. at home or school) using Python and a basic robotics kit or a robot simulator.

The **project report** should include the following topics **(8 to 12 Pages)** :

1. **Title Page** - Project title, student names, class, and institution.
2. **Project Overview** - Introduction, problem statement, objectives, and expected outcomes.
3. **Hardware and Software Requirements** - Components, tools, and their purposes.
4. **Data Collection and Cleaning** - Data sources, how the data was collected, and how missing or wrong values were handled.
5. **System Design** - Sense-Think-Act diagram, flowchart, and simple circuit diagram (if hardware is used).
6. **Python Implementation** - Use of variables, operators, conditions, loops, lists, functions, and modules.
7. **Hardware or Simulation Setup** - Assembly, connections, or simulator settings used to run the project.
8. **Testing and Results** - Test cases, observations, screenshots or photographs, and at least one graph of the results.
9. **Safety, Privacy and Ethics** - How the project keeps people safe, protects personal data, and avoids unfair results.
10. **Challenges and Limitations** - Problems faced, solutions tried, and remaining limitations.
11. **Conclusion and Future Improvements**

12. **References**
13. **Appendices** - Source code, data files, and detailed test results.

**** Subject Teacher/ Instructor and HOD/Principal with name, signature and stamp for verification***

Assessment Criteria (Yearly Project)		**Marks**
Problem and Planning	Problem and objectives (1); Sense-Think-Act diagram or flowchart (2).	**3**
Python Programming	Correct use of variables and operators (1), conditions and loops (2), lists (1), and functions & modules (2).	**6**
Data Handling	Suitable data collected or supplied (1); missing or duplicate values handled (2); at least one graph with a short explanation (2).	**5**
Hardware or Simulation	Correct setup or connections (2); program controls the device or simulation (2); the required task is performed (1).	**5**
Testing and Results	Suitable test cases (2); results recorded and errors explained (2).	**4**
Project Report	Complete and clearly organized report (1); diagrams, photographs, or screenshots (1); discussion of safety, privacy and ethics (1); conclusion and sources (1).	**4**
Demonstration and Presentation	Project Demonstration; explanation (1).	**3**

Sample Yearly Projects List

- **Smart Room Light**
  Develop a system that switches on an LED or lamp when the room becomes dark, using a light sensor (LDR). Record the light readings in a file, draw a simple graph, and compare it with the lights ON/OFF times.
- **Smart Fan Controller**
  Develop a system that switches on a small fan when the temperature crosses a set limit. Store the user's last few preferred temperatures and use their average as the new limit to show how a smart device learns.
- **Smart Door Lock with PIN**
  Develop a lock system that opens a servo-based latch when the correct PIN is entered. Sound a buzzer after three wrong attempts and keep a record of all attempts.
- **Robot That Stops at Obstacles**
  Develop a small robot (real or simulated) that moves forward and stops when an obstacle is detected by a distance sensor. Show the Sense-Think-Act steps in the code and test objects at different distances.
- **Smart Plant-Watering Reminder**
  Develop a system that reads soil moisture and displays a message or turns on an LED when the plant needs water. Test dry and wet soil samples and record the readings.
- **Smart Energy Saver**
  Develop a system that uses a motion sensor (PIR) to switch off a light when no one is in the room. Record ON/OFF times for a few days and draw a bar chart of the energy saved.
- **Classroom Object Recognizer**
  Use a teacher-provided image model (e.g. Teachable Machine) to recognize three classroom objects. Show the result with an LED, buzzer, or screen message, and record correct and incorrect predictions in a table.
- **Water-Tank Level Alert**

Develop a system that measures the water level with an ultrasonic sensor and gives an alert when the tank is nearly empty or full. Test different levels and record the system's responses.

- **Safe Delivery Robot**
  Develop a robot (real or simulated) that moves along a short marked path and stops when a person comes closer than a safe distance. Explain the safety rule and one ethical point in robot programming.
- **Mini Weather Station Data Logger**
  Develop a system that records temperature and humidity at fixed times and saves them in a CSV file. Clean the data, draw a line graph, and describe one pattern you observe.

Viva Voce (5 x 2 = 10 Marks)

Questions shall assess theoretical knowledge, practical implementation, programming logic, and understanding of AI applications and Robotics.

Note: Only five questions will be asked. No additional question is allowed.

Assessment Summary

Component	Maximum Marks
Theory Paper	**40**
Practical Paper	**60**
Grand Total	**100**

Laboratory Requirements

The institution should arrange the facilities required by the prescribed practical syllabus, such as:

- Computers with suitable processing capabilities.
- Python or another officially prescribed programming environment.
- Required libraries or software tools.
- Approved datasets or sample input files.
- Internet access, if required and permitted.
- Basic robotics kits (such as Arduino or micro:bit with simple sensors) or a robot simulator.
- Project documentation and practical assessment sheets.

External Examiner

To promote transparency, reliability, and validity, practical examinations shall be conducted and assessed in accordance with the applicable FBISE examination policy.

Responsibilities

- Oversee the practical examination process.
- Ensure that examinations follow the prescribed policy and practical syllabus.
- Evaluate students' hands-on AI and Robotics skills.
- Assess the student's understanding of algorithms, implementation, testing, and outputs.
- Verify and sign the final mark sheets as required.
- Maintain fairness and address examination-related concerns.
- Ensure that the required computers, laboratory facilities, software, and hardware are available.
- The number and appointment of external examiners shall follow the applicable FBISE policy.

Supporting Staff (Internal)

Lab Assistant / Technical Support Staff

- Prepare computers, laboratory equipment, and required software.

- Check the availability of Python or other prescribed programming environments.
- Arrange datasets, practical instructions, and project/portfolio folders.
- Ensure that the required software libraries and tools are available.
- Assist with technical issues without completing practical tasks on behalf of students.
- Maintain the laboratory environment during the examination.

Lab Attendant

- Assist in preparing the laboratory.
- Help arrange computers and examination materials.
- Support the laboratory staff in maintaining an orderly examination environment.
- Facilitate the logistical requirements of external examiners.

Federal Board SSC-I Examination

PRACTICAL MODEL QUESTION PAPER
ARTIFICIAL INTELLIGENCE & ROBOTICS

Time Allowed: 4 Hours **Total Marks: 60**

Instructions:

1. Attempt all questions.
2. Write clear and properly identified Python code wherever required.
3. Display appropriate outputs and explain the results where necessary.
4. Marks will be awarded according to the candidate's performance, accuracy, implementation, and understanding.

Q1. Develop a Python Smart Room Controller using functions. The program should: **5x2=10 Marks**

- **a)** Take room temperature (°C) and light level (0–100) as input from the user.
- **b)** Define a function **check_fan(temp)** that returns "Fan ON" if temp is above 30, else "Fan OFF".
- **c)** Define a function **check_light(level)** that returns "Light ON" if level is below 40, else "Light OFF".
- **d)** Call both functions and display the results.
- **e)** Use a loop to repeat the program for three (03) different sets of readings

Q2. A CSV file contains a city's temperature for ten days (**Day, Temperature**), with some missing values and one repeated row. Using Python, perform the following tasks: **5x2=10 Marks**

- **a)** Load the file using pandas and display the first five rows.
- **b)** Find the missing values and the duplicate row.
- **c)** Fill missing values with the average temperature and remove the duplicate row.
- **d)** Draw a line graph of temperature against day using matplotlib, with a title and axis labels.
- **e)** State the hottest and the coldest day from the graph.

Q3. Yearly Project **30 Marks**

Q4. Viva voce **5x2=10 Marks**