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CBSE Class 9 Artificial Intelligence (Code: 417)

Home Exam 2025-26 - Sample Paper Set 3 (Revised Edition) with
Solutions

Based on Latest CBSE Syllabus 2025-26

Maximum Marks	80 (Theory: 50 + Practical/Viva: 30)
Time Allowed	3 Hours
Class	IX (Nine)
Subject	Artificial Intelligence (417)

GENERAL INSTRUCTIONS:

1. This question paper contains **35 questions** divided into **Five Sections A, B, C, D and E**.
2. **Section A** comprises of 15 MCQs of 1 mark each.
3. **Section B** comprises of 5 Very Short Answer questions of 2 marks each.
4. **Section C** comprises of 6 Short Answer questions of 3 marks each.
5. **Section D** comprises of 3 Long Answer questions of 5 marks each.
6. **Section E** comprises of 3 case study based questions of 4 marks each with internal choice.
7. All questions are **compulsory**. However, internal choices have been provided in some questions.
8. Answer systematically and write clearly.

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SECTION A - MULTIPLE CHOICE QUESTIONS (1 × 15 = 15 Marks)

- Q1.** Instagram filters that detect and track faces use which AI domain? [1]
- (a) Natural Language Processing
 - (b) Computer Vision
 - (c) Data Mining
 - (d) Text Analytics
- Q2.** Grammarly checking grammar and suggesting corrections uses: [1]
- (a) Computer Vision
 - (b) Robotics
 - (c) Natural Language Processing
 - (d) Data Visualization
- Q3.** "Blood type: A/B/AB/O" is an example of: [1]
- (a) Quantitative data
 - (b) Continuous data
 - (c) Qualitative data
 - (d) Numerical data
- Q4.** The median of 16, 12, 20, 14, 18 is: [1]
- (a) 14
 - (b) 16
 - (c) 18
 - (d) 20
- Q5.** A box contains 3 red, 4 blue, and 5 green marbles. The probability of drawing a green marble is: [1]
- (a) $\frac{3}{12}$
 - (b) $\frac{4}{12}$
 - (c) $\frac{5}{12}$
 - (d) $\frac{7}{12}$
- Q6.** Which company developed ChatGPT? [1]
- (a) Google
 - (b) Microsoft
 - (c) OpenAI
 - (d) Meta

- Q7.** What is the output of: `print(18 // 5)`? [1]
- (a) 3
 - (b) 3.6
 - (c) 4
 - (d) 13
- Q8.** Which method adds an element at the end of a Python list? [1]
- (a) `add()`
 - (b) `append()`
 - (c) `insert()`
 - (d) `extend()`
- Q9.** The 'break' statement in Python is used to: [1]
- (a) End the program
 - (b) Exit a loop
 - (c) Skip an iteration
 - (d) Restart a loop
- Q10.** Data Acquisition stage focuses on: [1]
- (a) Cleaning data
 - (b) Collecting data
 - (c) Training model
 - (d) Testing model
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- Q11.** Which symbol is used for NOT EQUAL TO in Python? [1]
- (a) `<>`
 - (b) `!=`
 - (c) `==`
 - (d) `=!`
- Q12.** What will be the type of: `x = 5.5`? [1]
- (a) `int`
 - (b) `float`
 - (c) `str`
 - (d) `bool`

Q13. Which measure of central tendency is best for skewed data? [1]
(a) Mean
(b) Median
(c) Mode
(d) Range

Q14. Scatter plot is used to show: [1]
(a) Parts of whole
(b) Trends over time
(c) Relationship between two variables
(d) Frequency distribution

Q15. Amazon's Alexa is an example of: [1]
(a) Narrow AI
(b) General AI
(c) Super AI
(d) Non-AI system

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SECTION B - VERY SHORT ANSWER QUESTIONS (2 × 5 = 10 Marks)

Q16. What is Computer Vision? Give one real-world application. [2]

Q17. What is the difference between AI and Machine Learning? [2]

Q18. Find the mode of: 7, 4, 9, 7, 12, 7, 15, 4, 7 [2]

Q19. Write a Python program to find the area of a circle when radius is entered by user. [2]
(Formula: Area = $\pi \times r^2$)

Q20. Name any four applications of AI in education sector. [2]

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SECTION C - SHORT ANSWER QUESTIONS (3 × 6 = 18 Marks)

Q21. Explain Data Acquisition stage of AI Project Cycle. What are primary and secondary sources of data? [3]

Q22. What is bias in AI? How can we reduce bias in AI systems? Give two methods. [3]

Q23. Two dice are rolled together. Find the probability of getting: [3]

(i) A sum of 8

(ii) A sum that is a prime number

OR

Calculate the mean and median of: 33, 28, 41, 35, 30, 38, 29

Q24. Write a Python program to check if a year entered by user is a leap year or not. [3]

Q25. Explain three negative impacts of AI on society. [3]

Q26. What is the difference between bar chart and histogram? When would you use each? [3]

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SECTION D - LONG ANSWER QUESTIONS (5 × 3 = 15 Marks)

Q27. Explain how AI is used in autonomous vehicles (self-driving cars). Which AI domains are involved and what challenges exist? [5]

OR

Explain the complete AI Project Cycle with an example of "Weather Prediction System."

Q28. Write a Python program that: [5]

(a) Takes a string input from user

(b) Counts and displays the number of vowels

(c) Counts and displays the number of consonants

(d) Counts and displays the number of digits

(e) Counts and displays the number of spaces

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Q29. A restaurant tracked customer ratings (out of 5) for a week:

[5]

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Rating	4.2	4.5	3.8	4.8	4.6	4.9	4.7

- (a) Calculate the average rating for the week.
- (b) Find the median rating.
- (c) On which day was the rating lowest and highest?
- (d) How many days received ratings above 4.5?
- (e) What percentage of days had ratings below 4.5?

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SECTION E - CASE STUDY BASED QUESTIONS ($4 \times 3 = 12$ Marks + 3 Internal Choice = 15 Marks)

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CASE STUDY 1: AI in Wildlife Conservation

A wildlife sanctuary uses AI-powered camera traps to monitor endangered species. The system:

- Automatically identifies different animal species from images
- Counts population of each species
- Detects poaching activities by identifying humans with weapons
- Tracks movement patterns of animals

The AI was trained on 100,000 wildlife images and achieves 94% accuracy in species identification. It alerts rangers immediately when suspicious activity is detected, helping prevent 85% of poaching attempts.

Based on the above information, answer the following questions:

(i) Which AI domain is used for identifying animals from images? **[1 mark]**

(ii) Is "number of animals" qualitative or quantitative data? **[1 mark]**

OR

Which stage of AI Project Cycle involves "training on 100,000 images"?

(iii) How does this AI system contribute to wildlife conservation and SDG 15 (Life on Land)? Give two points. **[2 marks]**

CASE STUDY 2: AI-Powered Mental Health Chatbot

A mental health app uses AI chatbot to provide emotional support. Features:

- Analyzes user's text messages to detect emotional state (NLP)
- Identifies signs of depression, anxiety, stress from conversation patterns
- Provides coping strategies and relaxation exercises
- Suggests professional help when needed
- Available 24/7 for immediate support

The chatbot uses sentiment analysis to understand if the user is feeling sad, angry, anxious, or happy. Privacy is maintained - conversations are encrypted and anonymous.

Based on the above information, answer the following questions:

(i) Which AI domain is used for understanding emotions from text? **[1 mark]**

(ii) What is sentiment analysis? **[1 mark]**

OR

Why is privacy important in mental health applications?

(iii) What are two benefits and one limitation of using AI chatbots for mental health support? **[2 marks]**

CASE STUDY 3: Food Delivery Platform Analytics

A food delivery app analyzed delivery times (in minutes) for 6 different areas:

Area	A	B	C	D	E	F
Time (min)	28	35	22	40	30	25

Based on the above information, answer the following questions:

(i) Calculate the average delivery time. [1 mark]

(ii) Which area has the fastest delivery? [1 mark]

OR

What is the range of delivery times?

(iii) Write Python code to store delivery times and find how many areas have delivery time less than 30 minutes. [2 marks]

 **END OF QUESTION PAPER** 

Theory Total Marks: 50

Section A: 15 marks | Section B: 10 marks | Section C: 18 marks

Section D: 15 marks | Section E: 12 marks

Practical/Viva/Project: 30 marks

Grand Total: 80 marks

DETAILED ANSWER KEY WITH SOLUTIONS

SECTION A - ANSWERS (1 × 15 = 15 Marks)

Q1. Answer: (b) Computer Vision

Explanation: Instagram filters use Computer Vision to detect faces, identify facial features, and apply real-time effects by tracking facial movements.

Q2. Answer: (c) Natural Language Processing

Explanation: Grammarly uses NLP to understand grammar rules, context, and sentence structure to detect errors and suggest improvements in writing.

Q3. Answer: (c) Qualitative data

Explanation: Blood types (A, B, AB, O) represent categories or qualities, not numerical measurements, making them qualitative/categorical data.

Q4. Answer: (b) 16

Solution:

Data: 16, 12, 20, 14, 18

Arrange in order: 12, 14, 16, 18, 20

Number of values = 5 (odd)

Median = Middle value = 3rd term = 16

Q5. Answer: (c) 5/12

Solution:

Total marbles = $3 + 4 + 5 = 12$

Green marbles = 5

$P(\text{green}) = 5/12$

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Q6. Answer: (c) OpenAI

Explanation: ChatGPT is developed by OpenAI. Google developed Gemini, Microsoft supports OpenAI, Meta developed LLaMA.

Q7. Answer: (a) 3

Solution: The // operator performs floor division (integer division)

$18 // 5 = 3$ (quotient, remainder discarded)

Q8. Answer: (b) append()

Explanation: The append() method adds a single element at the end of a list.

Example: `list.append(5)`

Q9. Answer: (b) Exit a loop

Explanation: The 'break' statement terminates the loop immediately and control moves to the statement after the loop.

Q10. Answer: (b) Collecting data

Explanation: Data Acquisition (2nd stage) focuses on gathering relevant data from various sources for the AI project.

Q11. Answer: (b) !=

Explanation: The != operator checks if two values are not equal. Example: $5 != 3$ returns True

Q12. Answer: (b) float

Explanation: 5.5 is a decimal number, so Python automatically assigns it the float (floating-point) data type.

Q13. Answer: (b) Median

Explanation: Median is best for skewed data because it's not affected by extreme values (outliers), unlike mean which gets distorted.

Q14. Answer: (c) Relationship between two variables

Explanation: Scatter plots show correlation and patterns between two numerical variables by plotting points on X-Y axes.

Q15. Answer: (a) Narrow AI

Explanation: Alexa is Narrow AI - designed for specific tasks (voice commands, playing music, smart home control) but can't perform tasks outside its domain.

SECTION B - ANSWERS (2 × 5 = 10 Marks)

Q16. Solution:

Marking Scheme: 1 mark for definition + 1 mark for application

Computer Vision: Computer Vision is a branch of AI that enables computers to interpret and understand visual information from images and videos, allowing machines to "see" and make decisions based on what they observe.

Real-world Application:

Airport Security - Facial Recognition: Airports use Computer Vision to automatically identify passengers by matching their live face with passport photos. The system detects facial features, compares them with database records, and verifies identity without manual checking, improving security and reducing wait times.

(Other examples: Self-driving cars detecting obstacles, Medical image analysis for disease diagnosis, Quality control in manufacturing, Barcode/QR code scanning)

Q17. Solution:

Marking Scheme: 1 mark for each definition with distinction

Artificial Intelligence (AI):

- Broad concept of creating intelligent machines
- Any system that mimics human intelligence
- Includes both rule-based and learning-based systems
- Can use predefined instructions or learn from data

Machine Learning (ML):

- Subset of AI
- Specifically focuses on learning from data
- Improves performance through experience
- Does not require explicit programming for every scenario

Key Difference:

AI is the goal (creating intelligent systems), while ML is a method to achieve that

goal (by learning from data). All ML is AI, but not all AI is ML.

Example: A chess program with fixed rules is AI but not ML. A spam filter that learns from examples is both AI and ML.

Q18. Solution:

Marking Scheme: 1 mark for frequency count + 1 mark for mode

Data: 7, 4, 9, 7, 12, 7, 15, 4, 7

Frequency count:

7 appears 4 times

4 appears 2 times

9, 12, 15 appear 1 time each

Mode = 7 (most frequently occurring value)

Q19. Solution:

Marking Scheme: 1 mark for input and formula + 1 mark for calculation and output

Python Program:

```
# Program to find area of circle
import math

radius = float(input("Enter radius of circle: "))

area = math.pi * radius ** 2
# OR: area = 3.14159 * radius * radius

print("Area of circle with radius", radius, "is", area)
```



Sample Output:

Enter radius of circle: 7

Area of circle with radius 7.0 is 153.93804002589985

Alternative without math module:

area = 3.14159 * radius * radius

Q20. Solution:

Marking Scheme: 0.5 mark for each application (4 applications)

Four AI Applications in Education:

- 1. Personalized Learning Platforms:** Adapts content difficulty and pace based on individual student performance
- 2. Intelligent Tutoring Systems:** Provides one-on-one virtual tutoring, answers student queries 24/7
- 3. Automated Grading:** AI evaluates objective assessments, essays, and provides instant feedback
- 4. Student Performance Prediction:** Identifies at-risk students early by analyzing attendance, grades, and engagement patterns

(Other applications: Language learning apps, Virtual classrooms with AI assistants, Plagiarism detection, Administrative automation)

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SECTION C - ANSWERS (3 × 6 = 18 Marks)**Q21. Solution:**

Marking Scheme: 1.5 marks for Data Acquisition explanation + 1.5 marks for sources

Data Acquisition Stage:

Data Acquisition is the second stage of the AI Project Cycle where we collect relevant data needed to solve the problem identified in Problem Scoping. Quality and quantity of data directly affect model performance.

Activities:

- Identify what data is needed
- Determine data sources
- Collect data systematically
- Ensure data quality and relevance
- Store data securely

Primary Sources (Original Data):

Data collected directly for the specific purpose:

- **Surveys and Questionnaires:** Collecting responses directly from target users
- **Experiments:** Conducting tests and recording results
- **Sensors and IoT Devices:** Real-time data from temperature sensors, GPS, etc.
- **Observations:** Recording behavior, events as they happen
- **Interviews:** Direct conversations with stakeholders

Example: Conducting student survey about learning preferences

Secondary Sources (Existing Data):

Data already collected by someone else for different purposes:

- **Public Datasets:** Kaggle, UCI Machine Learning Repository, government databases
- **Research Papers:** Published studies with data
- **Company Records:** Historical sales, customer data
- **Web Scraping:** Extracting data from websites
- **APIs:** Weather data, stock prices from services

Example: Using government census data for population analysis

Q22. Solution:

Marking Scheme: 1 mark for bias definition + 1 mark for each method (2 methods)

Bias in AI:

Bias in AI occurs when the system produces unfair or discriminatory results that favor certain groups over others. It happens when training data or algorithms contain prejudices, leading to unfair decisions.

Example: A hiring AI trained mostly on male resumes might unfairly reject qualified female candidates.

Two Methods to Reduce Bias:

1. Diverse and Representative Data:

- Collect data from all demographic groups equally
- Include diverse examples in training set
- Balance dataset - equal representation
- Remove historical bias from data
- Regular audits to check data diversity

Example: For face recognition, include faces of all races, ages, genders equally

2. Diverse Development Teams:

- Teams from different backgrounds bring varied perspectives
- Can identify biases others might miss
- Understand needs of different user groups
- Challenge assumptions during development
- Create more inclusive AI systems

Example: Team with diverse gender, ethnicity, age can spot gender/racial bias better

Other Methods:

- Regular bias testing and audits
- Transparency in AI decision-making
- Using fairness algorithms

- Human oversight and review
- Involving affected communities in design

Q23. Solution:

Marking Scheme: 1.5 marks for each part

Two dice rolled together

Total possible outcomes = $6 \times 6 = 36$

(i) P(sum = 8):

Favorable outcomes: (2,6), (3,5), (4,4), (5,3), (6,2) = 5 outcomes

$P(\text{sum} = 8) = 5/36$

(ii) P(sum is prime):

Prime sums possible: 2, 3, 5, 7, 11

Sum = 2: (1,1) = 1 way

Sum = 3: (1,2), (2,1) = 2 ways

Sum = 5: (1,4), (2,3), (3,2), (4,1) = 4 ways

Sum = 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) = 6 ways

Sum = 11: (5,6), (6,5) = 2 ways

Total = $1 + 2 + 4 + 6 + 2 = 15$

$P(\text{prime sum}) = 15/36 = 5/12$

OR

Data: 33, 28, 41, 35, 30, 38, 29

Mean:

Mean = $(33 + 28 + 41 + 35 + 30 + 38 + 29) / 7$

Mean = $234 / 7$

Mean = 33.43 (approximately)

Median:

Arrange: 28, 29, 30, 33, 35, 38, 41

Number of values = 7 (odd)

Median = 4th term = 33

Q24. Solution:

Marking Scheme: 1 mark for input + 1 mark for leap year logic + 1 mark for output

Python Program for Leap Year:

```
# Program to check leap year
year = int(input("Enter a year: "))

# Leap year logic:
# Divisible by 4 AND (not divisible by 100 OR divisible
if (year % 4 == 0 and year % 100 != 0) or (year % 400 =
    print(year, "is a leap year")
else:
    print(year, "is not a leap year")
```

Sample Outputs:

Enter a year: 2024

2024 is a leap year

Enter a year: 2023

2023 is not a leap year

Enter a year: 2000

2000 is a leap year

Enter a year: 1900

1900 is not a leap year

Leap Year Rules:

1. If divisible by 4 → Leap year (mostly)

2. Except if divisible by 100 → Not leap year
3. Except if divisible by 400 → Leap year

Q25. Solution:

Marking Scheme: 1 mark for each negative impact (3 impacts)

Three Negative Impacts of AI on Society:

1. Job Displacement and Unemployment:

- AI automation replacing human workers in many jobs
- Factory workers, data entry clerks, cashiers, drivers at risk
- Creates economic hardship for displaced workers
- Widens wealth gap - tech companies profit while workers suffer
- Requires expensive retraining for new skills
- Some jobs may never return

Example: Self-checkout machines replacing cashiers, automated customer service replacing call center agents

2. Privacy Invasion and Surveillance:

- AI systems collect massive amounts of personal data
- Facial recognition enables constant tracking
- Companies know intimate details about our lives
- Governments can misuse for mass surveillance
- Data breaches expose sensitive information
- Loss of anonymity and freedom

Example: Social media AI analyzing every post, photo, message to build detailed profiles for targeted ads

3. Spread of Misinformation and Deepfakes:

- Generative AI creates fake videos, images, audio
- Deepfakes can impersonate anyone convincingly
- Difficult to distinguish real from fake content
- Used to spread fake news and propaganda
- Damages reputations through fabricated content
- Undermines trust in media and institutions

Example: Fake videos of politicians saying things they never said, AI-generated fake news articles

Other Negative Impacts:

- Algorithmic bias and discrimination
- Addiction to AI-powered apps (social media)
- Reduced human interaction and social skills
- Over-dependence on technology
- Environmental impact (energy consumption)

Q26. Solution:

Marking Scheme: 1.5 marks for differences + 1.5 marks for usage

Bar Chart vs Histogram - Differences:

BAR CHART:

- Shows categorical/discrete data
- Bars are separated by gaps
- Each bar represents a category
- Bars can be vertical or horizontal
- Order doesn't matter (can be rearranged)
- X-axis has categories (names, labels)

HISTOGRAM:

- Shows continuous numerical data
- Bars touch each other (no gaps)
- Each bar represents a range (bin/interval)
- Always vertical bars
- Order matters (cannot rearrange)
- X-axis has numerical ranges

When to Use Bar Chart:

- Comparing different categories
- Example: Sales by product (Laptop: 50, Phone: 75, Tablet: 30)
- Example: Number of students per class (IX: 40, X: 45, XI: 38)

- Example: Favorite colors survey results

When to Use Histogram:

- Showing frequency distribution of continuous data
- Example: Student heights (140-150cm: 10 students, 150-160cm: 25 students)
- Example: Test scores (0-20: 5, 20-40: 15, 40-60: 30)
- Example: Age distribution in population

Visual Difference:

Bar Chart: ■ ■ ■ (gaps between bars)

Histogram: ■ ■ ■ (bars touching)

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SECTION D - ANSWERS (5 × 3 = 15 Marks)

Q27. Solution:

Marking Scheme: 2 marks for AI domains + 2 marks for how it works + 1 mark for challenges

AI in Autonomous Vehicles (Self-Driving Cars):

AI Domains Involved:

1. Computer Vision (Primary):

- Cameras capture surroundings in real-time
- Detects roads, lane markings, traffic signs
- Identifies pedestrians, cyclists, other vehicles
- Recognizes traffic lights and their colors
- Estimates distances to objects
- Monitors blind spots

2. Data Analytics:

- Processes sensor data (LiDAR, radar, cameras)
- Analyzes traffic patterns and road conditions

- Predicts behavior of other vehicles and pedestrians
- Makes navigation decisions
- Route optimization using real-time traffic data

3. Machine Learning:

- Learns from millions of driving scenarios
- Improves decision-making over time
- Adapts to different weather, road conditions
- Continuous learning from fleet data

How It Works:

Step 1 - Perception:

- Multiple cameras provide 360° view
- LiDAR creates 3D map using laser beams
- Radar detects objects in fog/darkness
- Ultrasonic sensors for close obstacles

Step 2 - Processing:

- AI combines all sensor inputs
- Creates complete understanding of environment
- Identifies all objects and their movement

Step 3 - Planning:

- Predicts what other vehicles will do
- Plans safe trajectory
- Decides: accelerate, brake, turn, stop

Step 4 - Control:

- Executes decisions through steering, throttle, brakes
- Adjusts in real-time (hundreds of times per second)

Challenges:

1. Safety and Reliability:

- Must handle all possible scenarios perfectly
- No room for error - lives at stake

- Difficult to anticipate every situation
- Need 99.9999% accuracy

2. Complex Situations:

- Unpredictable human behavior (jaywalking, sudden lane changes)
- Construction zones with changing routes
- Bad weather reducing sensor effectiveness
- Ethical dilemmas (trolley problem)

3. Technical Limitations:

- Requires enormous computational power
- Expensive hardware (LiDAR costs thousands)
- Needs constant connectivity for updates
- Cybersecurity threats - hacking risks

4. Legal and Regulatory:

- Who's liable in accidents?
- Unclear regulations in most countries
- Insurance questions
- Need for new traffic laws

5. Social Acceptance:

- Public distrust of autonomous systems
- Job loss for drivers (taxis, trucks)
- Resistance to change

OR

AI Project Cycle - Weather Prediction System Example:

Stage 1: Problem Scoping

Define Problem: Predict accurate weather (temperature, rain, storms) for next 7 days for agricultural planning

Goal: Help farmers plan irrigation and harvesting

Success Criteria: 85% accuracy in predictions

Stakeholders: Farmers, agricultural departments, general public

Constraints: Limited weather stations in rural areas, real-time processing needed

Stage 2: Data Acquisition

Primary Sources:

- Weather stations measuring temperature, humidity, pressure
- Satellites capturing cloud images
- Radar for rainfall detection
- Ocean buoys for sea conditions

Secondary Sources:

- Historical weather data from meteorological departments
- Global weather databases
- Climate research papers

Collect: 10 years of hourly weather data from 1000+ stations

Stage 3: Data Exploration

Data Cleaning:

- Remove incomplete sensor readings
- Handle missing values (interpolation)
- Correct erroneous data (like temperature = 500°C)

Analysis:

- Identify seasonal patterns
- Correlate temperature with pressure, humidity
- Visualize trends using graphs

Feature Selection:

- Key features: temperature, pressure, humidity, wind speed, cloud cover
- Create derived features: temperature change rate

Normalization:

- Scale all values to similar ranges
- Encode categorical data (sunny/cloudy/rainy → 0/1/2)

Stage 4: Modeling

Algorithm Selection:

- Choose Neural Networks for pattern recognition
- Time-series forecasting algorithms

Training:

- Use 80% data (8 years) for training
- Model learns relationships: high humidity + low pressure = rain likely
- Adjust parameters (weights) to minimize prediction errors

- Train for multiple iterations (epochs)

Testing:

- Use remaining 20% (2 years) to test accuracy

Stage 5: Evaluation

Accuracy Testing:

- Achieved 87% accuracy (exceeds 85% goal)
- Compare predictions with actual weather
- Calculate error rates

Analysis:

- Model accurate for temperature and rain
- Struggles with sudden storm predictions
- Works well for 3-day forecasts, less accurate for 7-day

Stakeholder Feedback:

- Farmers find it helpful for irrigation planning
- Request longer-term forecasts

Deployment:

- Launch as mobile app and website
- Provide daily updates

Monitoring:

- Continuously retrain with new data
- Update model monthly
- Track real-world accuracy

Q28. Solution:

Marking Scheme: 1 mark for each part (a to e)

Complete Python Program:

```
# Program to count vowels, consonants, digits, spaces

# (a) Take string input
text = input("Enter a string: ")

# Initialize counters
```

```
vowels = 0
consonants = 0
digits = 0
spaces = 0

# Define vowels
vowel_list = "aeiouAEIOU"

# Process each character
for char in text:
    # (b) Count vowels
    if char in vowel_list:
        vowels += 1
    # (c) Count consonants (alphabets but not vowels)
    elif char.isalpha():
        consonants += 1
    # (d) Count digits
    elif char.isdigit():
        digits += 1
    # (e) Count spaces
    elif char == ' ':
        spaces += 1

# Display results
print("\nResults:")
print("Vowels:", vowels)
print("Consonants:", consonants)
print("Digits:", digits)
print("Spaces:", spaces)
```

Sample Output:

Enter a string: Hello World 2025!

Results:

Vowels: 3

Consonants: 7

Digits: 4

Spaces: 2

Explanation:

"Hello World 2025!"

Vowels: e, o, o = 3

Consonants: H, l, l, W, r, l, d = 7

Digits: 2, 0, 2, 5 = 4

Spaces: 2

Q29. Solution:

Marking Scheme: 1 mark for each part (a to e)

Ratings: 4.2, 4.5, 3.8, 4.8, 4.6, 4.9, 4.7

(a) Average rating:

Average = $(4.2 + 4.5 + 3.8 + 4.8 + 4.6 + 4.9 + 4.7) / 7$

Average = $31.5 / 7$

Average = 4.5

(b) Median rating:

Arrange: 3.8, 4.2, 4.5, 4.6, 4.7, 4.8, 4.9

Number of values = 7 (odd)

Median = 4th term

Median = 4.6

(c) Lowest and highest:

Lowest: Wednesday (3.8)

Highest: Saturday (4.9)

(d) Days above 4.5:

Thu: 4.8, Fri: 4.6, Sat: 4.9, Sun: 4.7

4 days had ratings above 4.5

(e) Percentage below 4.5:

Days below 4.5: Mon (4.2), Wed (3.8), Tue (4.5 is not below 4.5)

Actually Mon (4.2) and Wed (3.8) = 2 days

Percentage = $(2/7) \times 100$

= **28.57%**

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SECTION E - ANSWERS (4 × 3 = 12 Marks)

Q30. Solution: CASE STUDY 1 - Wildlife Conservation

Marking Scheme: 1 + 1 + 2 = 4 marks

(i) Computer Vision is used for identifying animals from images.

Explanation: Computer Vision enables the AI to analyze images captured by camera traps, recognize different species by their visual features (body shape, patterns, size), and distinguish between animals.

(ii) "Number of animals" is Quantitative data.

Explanation: It represents a numerical count (5 tigers, 12 elephants) that can be measured and used in mathematical calculations.

OR

Training on 100,000 images happens in the **Modeling stage** (4th stage).

Explanation: Training the AI model with data to learn patterns and make predictions is done in the Modeling stage.

(iii) Contribution to wildlife conservation and SDG 15:

1. Prevents Poaching and Illegal Hunting:

- AI detects humans with weapons in protected areas
- Sends immediate alerts to forest rangers
- Prevents 85% of poaching attempts
- Protects endangered species from extinction
- 24/7 monitoring without human fatigue
- Covers large areas impossible to patrol manually

- Saves lives of elephants, tigers, rhinos

2. Accurate Population Monitoring:

- Automatically counts animals without disturbing them
- Tracks population trends over time
- Identifies if species numbers are declining
- Helps allocate conservation resources effectively
- Monitors migration patterns
- Early warning if species at risk
- Enables data-driven conservation decisions

SDG 15 - Life on Land:

This directly supports SDG 15 which aims to protect terrestrial ecosystems, prevent biodiversity loss, and combat poaching. The AI system helps achieve targets of protecting endangered species and halting wildlife trafficking.

Q31. Solution: CASE STUDY 2 - Mental Health Chatbot

Marking Scheme: 1 + 1 + 2 = 4 marks

(i) Natural Language Processing (NLP) is used for understanding emotions from text.

Explanation: NLP analyzes the user's text messages, understands context, identifies emotion-related words, and determines the emotional state.

(ii) Sentiment Analysis:

Sentiment Analysis is an NLP technique that analyzes text to determine the emotional tone - whether the sentiment is positive, negative, or neutral. It identifies feelings like happiness, sadness, anger, or anxiety from written language.

Example: Analyzing "I feel terrible today" → Negative sentiment, Sadness

OR

Privacy is important in mental health applications because:

- Mental health information is highly sensitive and personal
- Disclosure could lead to stigma and discrimination
- People won't seek help if they fear privacy breach

- Could affect employment, insurance, relationships
- Builds trust needed for honest communication
- Legal requirement (HIPAA laws protect health data)

(iii) Benefits and limitation:

Two Benefits:

1. 24/7 Immediate Accessibility:

- Available anytime, anywhere
- No waiting for appointments
- Crucial during crisis moments (late night anxiety attacks)
- Helps people in remote areas without therapists
- Free or low-cost compared to therapy sessions
- Reduces burden on mental health system

2. Reduces Stigma and Barriers:

- Anonymous - no fear of judgment
- Comfortable for people hesitant to see therapist
- First step before professional help
- Especially helpful for youth comfortable with technology
- No travel needed

One Limitation:

Cannot Replace Human Therapists:

- Lacks human empathy and emotional understanding
- Cannot handle complex mental health conditions
- May miss subtle signs of serious issues like suicidal thoughts
- No genuine human connection and warmth
- Cannot provide nuanced, personalized therapy
- Risk of giving inappropriate advice in serious cases
- Should complement, not replace, professional help

Q32. Solution: CASE STUDY 3 - Food Delivery Analytics

Marking Scheme: 1 + 1 + 2 = 4 marks

Delivery times: 28, 35, 22, 40, 30, 25 (in minutes)

(i) Average delivery time:

$$\text{Average} = (28 + 35 + 22 + 40 + 30 + 25) / 6$$

$$\text{Average} = 180 / 6$$

Average = 30 minutes

(ii) Area C has the fastest delivery with 22 minutes

OR

Range of delivery times:

$$\text{Range} = \text{Highest} - \text{Lowest}$$

$$\text{Range} = 40 - 22$$

Range = 18 minutes

(iii) Python code:

```
# Store delivery times
delivery_times = [28, 35, 22, 40, 30, 25]
areas = ['A', 'B', 'C', 'D', 'E', 'F']

# Count areas with delivery time < 30 minutes
fast_delivery_count = 0
fast_delivery_areas = []

for i in range(len(delivery_times)):
    if delivery_times[i] < 30:
        fast_delivery_count += 1
        fast_delivery_areas.append(areas[i])

print("Areas with delivery time less than 30 minutes:")
print("Count:", fast_delivery_count)
print("Areas:", fast_delivery_areas)

# Display all times
```

```
print("\nAll delivery times:")
for i in range(len(areas)):
    print(f"Area {areas[i]}: {delivery_times[i]} minute")
```

Output:

Areas with delivery time less than 30 minutes:

Count: 3

Areas: ['A', 'C', 'F']

All delivery times:

Area A: 28 minutes

Area B: 35 minutes

Area C: 22 minutes

Area D: 40 minutes

Area E: 30 minutes

Area F: 25 minutes

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 **END OF ANSWER KEY** 

All solutions based on CBSE Class 9 AI Syllabus 2025-26

Comprehensive step-by-step solutions with detailed marking schemes

Practical Component (30 marks):

- Python Programming Practicals (15 programs): 15 marks
 - AI Project Work with SDG Integration: 10 marks
 - Viva Voce & Student Portfolio: 5 marks

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