Class 10

Subject: ARTIFICIAL INTELLIGENCE

ANSWER KEY

A. Multiple Choice Questions (1 mark each)

(5 × 1 = 5 marks)

1. **B)** To test and improve the model's performance using unseen data
2. **C)** Deep Learning
3. **B)** Object Detection
4. **B)** Transparency and accountability
5. **B)** Semantic Analysis

B. Short-Answer Questions (2 marks each)

(2 × 2 = 4 marks)

6. Precision vs Recall

- **Precision** measures how many of the predicted positive results are actually correct.

  Precision=True PositivesTrue Positives + False Positives\text{Precision} = \frac{\text{True Positives}}{\text{True Positives + False Positives}}Precision=True Positives + False PositivesTrue Positives

- **Recall** measures how many actual positive cases the model correctly identifies.

  Recall=True PositivesTrue Positives + False Negatives\text{Recall} = \frac{\text{True Positives}}{\text{True Positives + False Negatives}}Recall=True Positives + False NegativesTrue Positives

Example (Recall more critical):
In **medical diagnosis (e.g., detecting cancer)**, Recall is more critical than Precision because it is more important to identify *all* potential patients (even if some are false alarms) than to miss a real case.

7. Importance of Hidden Layers in Neural Networks

Hidden layers help the network **learn complex patterns and representations** from data by performing **non-linear transformations**.

- They extract intermediate features between input and output.
- More hidden layers or neurons generally increase the **learning capacity**, allowing the model to capture deeper relationships — though too many can lead to overfitting.

C. Application-Based / Analytical Questions (3 marks each)

8. Crop Yield Prediction

a) **Type of AI Model:**

- This is a **Regression** problem since the target (crop yield) is a **continuous value**.

b) **Ensuring Reliability:**

- **Train-test split:** Divide data (e.g., 80% train, 20% test) to ensure that model performance is evaluated on unseen data.
- **Evaluation Metrics:** Use metrics such as **Mean Absolute Error (MAE)**, **Root Mean Squared Error (RMSE)**, or **R^2 score** to assess accuracy.
  These steps prevent overfitting and ensure the model generalizes well.

9. Comparison: Computer Vision vs NLP

Aspect	Computer Vision	Natural Language Processing (NLP)
Type of Data	Image or video data (pixels, colors, shapes)	Text or speech data (words, sentences, grammar)
Tools / Libraries	OpenCV, TensorFlow, Keras, PyTorch	NLTK, spaCy, Hugging Face Transformers
Ethical Concerns (Examples)	Facial recognition may violate privacy or exhibit racial bias	Resume screening or sentiment analysis may reinforce gender or language bias

D. Long-Answer Case-Based Question (5 marks)

10. Case Study: Ethical and Technical Evaluation of AI Recruitment Model

Where bias could have been introduced:

- **Data Collection:** If training data included more male resumes or gendered language (e.g., “leadership” associated more with males).
- **Feature Selection:** If gender-related words were unintentionally included as predictors.

- **Model Training:** Biased weighting during optimization could amplify data imbalances.

Evaluation Metrics to Reveal Bias:

- **Confusion Matrix** (split by gender) — reveals disproportionate false negatives/positives.
- **Fairness Metrics** such as **Demographic Parity**, **Equal Opportunity**, or **Disparate Impact Ratio** to measure bias across groups.
- **Precision/Recall per subgroup** — to check whether one gender consistently gets lower scores.

Applying Ethical Principles:

Principle	Application in Model Redesign
Autonomy	Allow candidates to understand and challenge automated decisions; ensure transparency in criteria.
Justice	Ensure fair treatment — use balanced datasets and fairness-aware algorithms to remove gender bias.
Non-maleficence	Avoid harm by preventing discriminatory outcomes that could harm job seekers' opportunities.
Beneficence	Use AI to *benefit all* applicants — e.g., anonymized resumes or bias mitigation techniques.