

## PRACTICE PAPER-4

Time: 2 Hours

Maximum Marks: 50

### General Instructions:

1. Please read the instructions carefully.
2. This Question Paper consists of **21 questions** in two sections: **Section A & Section B**.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. **Out of the given (5 + 16 =) 21 questions, a candidate has to answer (5 + 10 =) 15 questions in the allotted (maximum) time of 2 hours.**
5. All questions of a particular section must be attempted in the correct order.
6. **SECTION A—OBJECTIVE TYPE QUESTIONS (24 MARKS):**
  - (a) This section has 5 questions.
  - (b) Marks allotted are mentioned against each question/part.
  - (c) There is no negative marking.
  - (d) Do as per the instructions given.
7. **SECTION B—SUBJECTIVE TYPE QUESTIONS (26 MARKS):**
  - (a) This section has 16 questions.
  - (b) A candidate has to do 10 questions.
  - (c) Do as per the instructions given.
  - (d) Marks allotted are mentioned against each question/part.

### SECTION A: OBJECTIVE TYPE QUESTIONS

#### 1. Answer any 4 out of the given 6 questions on Employability Skills.

(1 × 4 = 4 marks)

- (a) Which principle of effective communication ensures the message contains all necessary information for the receiver?
  - (i) Courtesy
  - (ii) Completeness
  - (iii) Conciseness
  - (iv) Correctness
- (b) You have set a target to complete your homework before dinner and you organize your time and resources to achieve this target. Which self-management skill does this depict?
  - (i) Goal Setting
  - (ii) Flexibility
  - (iii) Self-Motivation
  - (iv) Physical Exercise
- (c) Which of the following is not a step for effective stress management?
  - (i) Avoiding all stressful situations completely
  - (ii) Practising relaxation techniques such as deep breathing
  - (iii) Talking to someone you trust about your feelings
  - (iv) Organizing your work and taking breaks when needed
- (d) What action is performed when you right-click on an icon or file?
  - (i) The file opens immediately.
  - (ii) A shortcut menu with options is displayed.
  - (iii) The file is moved to the Recycle Bin.
  - (iv) Multiple files are selected.
- (e) Jaya's tailoring shop successfully overcame its initial challenges. She now has loyal clients and earns steady profits, allowing her to focus on making her business more efficient and improving her services. Which stage is this?
  - (i) Retire
  - (ii) Grow
  - (iii) Survive
  - (iv) Enter
- (f) Providing access to free and quality education to children from underprivileged backgrounds helps achieve which Sustainable Development Goal?
  - (i) SDG 2 – Zero Hunger
  - (ii) SDG 3 – Good Health and Well-being
  - (iii) SDG 4 – Quality Education
  - (iv) SDG 12 – Responsible Consumption and Production

## 2. Answer any 5 out of the given 6 questions.

(1 × 5 = 5 marks)

- (a) Processing and understanding photographs to identify objects and patterns is a task performed in the ..... domain of AI.
- (b) **Assertion (A):** Rights-based ethical frameworks in AI emphasize the protection of human rights and dignity.  
**Reason (R):** The rights-based framework aims to ensure that AI systems do not violate human rights or discriminate against individuals and groups.
- (i) Both A and R are correct and R is the correct explanation of A.
  - (ii) Both A and R are correct but R is not the correct explanation of A.
  - (iii) A is correct but R is incorrect.
  - (iv) A is incorrect but R is correct.
- (c) An AI-based spam filter marks only those emails that contain specific keywords as spam. When spammers start using new words that are not in the filter, spam emails reach users' inboxes. What is the main reason for this?
- (i) The spam filter is based only on keyword matching.
  - (ii) Users are receiving too many emails.
  - (iii) The filter removes emails with images.
  - (iv) The spam filter was programmed by students.
- (d) ..... allows us to compare different models to choose the one that best solves the given problem. (Which stage of the AI Project lifecycle?)
- (e) ..... uses methods such as filtering and color adjustment on digital images and is a part of .....
- (i) Image Processing; Computer Vision
  - (ii) Object Detection; Image Processing
  - (iii) Computer Vision; Machine Learning
  - (iv) Classification; Computer Vision
- (f) State True or False:  
A 'Script bot' is more advanced than a 'Smart bot' because it can understand the user's intent and hold a conversation on topics it wasn't explicitly programmed for.

## 3. Answer any 5 out of the given 6 questions.

(1 × 5 = 5 marks)

- (a) A company is flooded with thousands of customer emails every day. They want to build a system that automatically reads each email, understands its topic (e.g., 'Billing Issue,' 'Product Defect,' 'Praise') and forwards it to the correct department. Which AI domain is this system based on?
- (i) Natural Language Processing
  - (ii) Computer Vision
  - (iii) Data Statistics
  - (iv) Recommender Systems
- (b)

Fruit	Color	Price
Apple	Red	INR 20
Orange	Orange	INR 10
Banana	Yellow	INR 5
Grape	Purple	INR 20
Kiwi	Green	INR 20

If we want to train an AI model to predict the 'Price' of a fruit based on its 'Fruit' name and 'Color', what is the 'Price' column called in a supervised learning problem?

- (i) Label
- (ii) Feature
- (iii) Instance
- (iv) Test Set



- (c) A computer vision model is trained to classify 200 images as either 'Cat' or 'Dog'. The model makes the following predictions:
- Correctly identifies 80 images as 'Cat'
  - Correctly identifies 90 images as 'Dog'
  - Mistakes 20 'Cat' images, predicting 'Dog'
  - Mistakes 10 'Dog' images, predicting 'Cat'

What is the overall **accuracy** of the model?

- (i) 0.90 (ii) 0.80  
(iii) 0.85 (iv) 0.95
- (d) **Assertion (A):** In machine learning, a dataset is split into a training set and a testing set.  
**Reason (R):** The model is evaluated using the training set to see how well it has learned and then it is taught using the testing set.
- (i) Both A and R are correct and R is the correct explanation of A.  
(ii) Both A and R are correct but R is not the correct explanation of A.  
(iii) A is correct but R is incorrect.  
(iv) A is incorrect but R is correct.
- (e)



Identify the application of Computer Vision from the given picture:

- (i) Facial Recognition (ii) CV in Retail  
(iii) Medical Imaging (iv) Face Filters
- (f) Count and write the number of **unique words** (after converting all to lowercase) in the following sentence:  
'A good model is a model that performs well.'

#### 4. Answer any 5 out of the given 6 questions.

(1 × 5 = 5 marks)

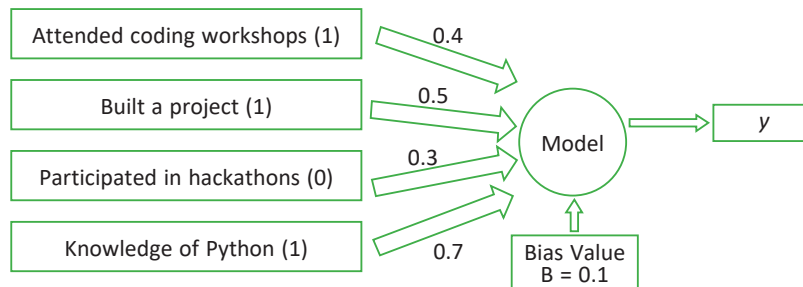
- (a) What does Data Visualization (using charts and graphs) provide in the Data Exploration stage?
- (i) The final project goal  
(ii) A way to collect new data from the internet  
(iii) Insights into data patterns, trends and outliers  
(iv) The programming code for the model
- (b) **Statement 1:** A model is considered 'overfitting' when it learns training data's noise and details so well that it fails to perform accurately on new, unseen test data.  
**Statement 2:** A good, well-generalized model should have similar accuracy on both training data and testing data.
- (i) Both Statement 1 and Statement 2 are correct.  
(ii) Both Statement 1 and Statement 2 are incorrect.  
(iii) Only Statement 1 is correct.  
(iv) Only Statement 2 is correct.
- (c) An AI system is used to screen students for a coding competition. Four factors are used:
- Attended coding workshops ( $x_1 = 1$ ,  $w_1 = 0.4$ )
  - Built a project ( $x_2 = 1$ ,  $w_2 = 0.5$ )
  - Participated in hackathons ( $x_3 = 0$ ,  $w_3 = 0.3$ )
  - Knowledge of Python ( $x_4 = 1$ ,  $w_4 = 0.7$ )

Bias value,  $b = 0.1$

$$y = w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4 + (1 \times b)$$

What is the value of  $y$  for this scenario?

- (i) 1.0
- (ii) 1.6
- (iii) 1.7
- (iv) 1.9



- (d) Why might a developer choose to prioritize high 'Recall' over high 'Precision' in a medical diagnosis model for a highly contagious disease?
- (i) Because the model needs to be as fast as possible.
  - (ii) Because it is more important to find all *actual* positive cases (e.g., all sick patients) even if some healthy ones are flagged incorrectly.
  - (iii) Because it is more important to ensure every patient flagged as 'sick' is sick, to avoid unnecessary treatment.
  - (iv) Because Recall is the same as Accuracy and is the best overall measure.
- (e) In the common RGB color model, a color is defined by a set of three numbers representing Red, Green and Blue. What color would the value (0, 0, 255) represent?
- (i) Pure Red
  - (ii) Pure Green
  - (iii) Pure Blue
  - (iv) White
- (f) Which stage of NLP is represented?



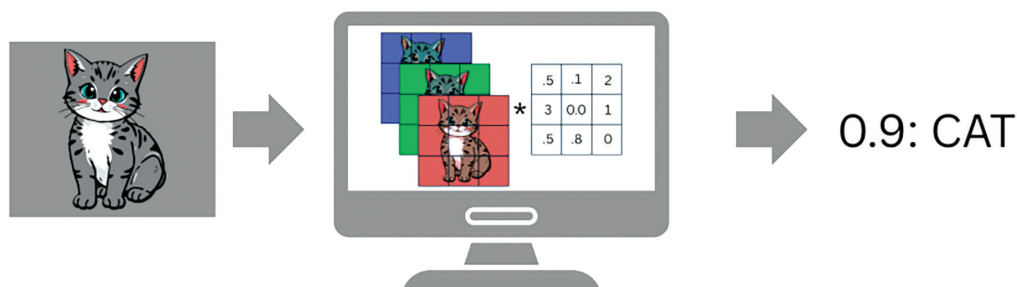
- (i) Syntactic Analysis
- (ii) Semantic Analysis
- (iii) Discourse Integration
- (iv) Pragmatic Analysis

**5. Answer any 5 out of the given 6 questions.**

**(1 × 5 = 5 marks)**

- (a) A bank uses an AI system to approve or deny home loans. The AI was trained on historical data that shows people from a specific, low-income zip code defaulted on loans more often. Which factor might *unconsciously* influence the AI to deny a new, financially healthy applicant?
- (i) The applicant's stable, high-paying job
  - (ii) The applicant's excellent credit score
  - (iii) The applicant's zip code
  - (iv) The size of the down payment
- (b) A weather model predicted 25 mm of rainfall but the actual rainfall measured was 20 mm. What is the absolute error of the prediction?
- (i) 1.25
  - (ii) 5
  - (iii) 0.20
  - (iv) 20

(c) Which computer vision task is shown in the given image?



- (i) Image Classification
  - (ii) Object Detection
  - (iii) Image Segmentation
  - (iv) Feature Extraction
- (d) ..... is the outcome of the model wrongly predicting the positive class as negative class.
- (e) What is the process of converting text to a standard format, such as converting all words to lowercase, removing punctuation and stemming words to their root?
- (i) Text Normalization
  - (ii) Bag-of-Words
  - (iii) Discourse Integration
  - (iv) Semantic Analysis
- (f) What are the stemmed and lemmatized forms of the word 'running'?
- (i) Stemmed: run, Lemmatized: running
  - (ii) Stemmed: running, Lemmatized: run
  - (iii) Stemmed: run, Lemmatized: run
  - (iv) Stemmed: runn, Lemmatized: run

## SECTION B – SUBJECTIVE TYPE QUESTIONS

**Answer any 3 out of the given 5 questions on Employability Skills in 20–30 words each. (2 × 3 = 6 marks)**

6. What is subject and predicate? Give an example.
7. Elaborate on the significance of relaxation techniques like deep breathing in stress reduction.
8. 'Malware or malicious software, is any software intentionally designed to cause disruption or gain unauthorized access to a computer.' Describe two different types of malware and their primary function.
9. Anjali owns a bakery. She notices that many customers are asking for gluten-free options. She spends three months testing new recipes and then launches a new line of gluten-free bread and cakes. She actively asks customers for their opinions to make the recipes even better. From the paragraph, identify and write the two entrepreneurial characteristics or functions that Anjali is demonstrating.
10. Explore and elaborate on the three major objectives of sustainable development.

**Answer any 4 out of the given 6 questions in 20–30 words each. (2 × 4 = 8 marks)**

11. How does the second stage (Data Acquisition) differ from the third stage (Data Exploration)?
12. Identify the type of deep learning model for each description:
  - (a) This model is the most fundamental, general-purpose neural network, inspired by the human brain's structure. It is often used for straightforward classification or regression tasks where the input is tabular data (like predicting house prices from features).
  - (b) This model is the core technology used in applications like speech recognition and music generation, where the order and context of data over time are critically important.
13. What is the key difference between **Classification** and **Regression** models in Supervised Learning?
14. Define evaluation and its role in AI model building.
15. What is a Grayscale Image? Explain how pixel values represent shades in a grayscale image.
16. Identify the stage of NLP and explain:
 

**Input:** (A person in a cold room says) "Wow, it's really warm in here."

**Output:** "The speaker is being ironic. The intended meaning is that it is actually very cold."

Answer any 3 out of the given 5 questions in 50–80 words each.

(4 × 3 = 12 marks)

17. Read the case study given below and answer the following questions:

An AI model is created to predict a person's risk of developing heart disease. The model is trained on historical patient data, which includes medical records, lab results and self-reported exercise levels. The AI learns that 'reporting low exercise' is a high-risk factor. However, the data was collected in a way that 'reporting low exercise' was also strongly correlated with patients from low-income, urban neighbourhoods who may not have safe areas to walk or time off from work.

- (a) What is the main problem with the training data that leads to a biased outcome for certain groups?
- (b) Mention two **bioethics principles** that are being violated by this model and explain your reasoning.

18. (a) What is the name of the learning model where an 'agent' learns to make decisions by performing actions in an environment to maximize a 'reward'?

- (b) Name two other key components of this learning model (besides the agent).
- (c) Explain the role of these two components in the learning process.

19. Identify the name of the application of Machine Learning (ML) or Deep Learning (DL) being used in the following scenarios:

- (a) A hospital uses an AI system to scan a patient's brain MRI. The AI highlights the exact, pixel-by-pixel outline of a tumor, separating it completely from the surrounding healthy brain tissue.
- (b) When you upload a group photo to your cloud storage, the AI automatically scans the faces. It then groups all photos of the same person (e.g., 'Person A,' 'Person B'), allowing you to search for photos of a specific friend.
- (c) An AI model is trained on a dataset of images where each image is given a single label, like 'Cat' or 'Dog.' When shown a new image, its only job is to decide if the entire picture is one or the other.
- (d) You use a video conferencing app that can apply a 'blur' or a custom image to everything behind you, while keeping you clearly in focus.

20. Read the following paragraph and answer the questions that follow:

A self-driving car's AI system is tested on 500 images to detect pedestrians. 'Pedestrian' is the positive class. The model correctly identified 80 images that contained a pedestrian. It also correctly identified 400 images that had no pedestrian. The model incorrectly predicted 'Pedestrian' for 10 images that had no pedestrian. It also missed 10 pedestrians, predicting 'No Pedestrian' when one was present.

- (a) Draw the confusion matrix for this pedestrian detection model.
- (b) Calculate the **Accuracy** of this model. Show your working.
- (c) Write the total number of False Negatives (number of times the model missed a pedestrian).

21. Read the following documents and answer the questions that follow:

- **Document 1:** 'AI is a fun subject.'
- **Document 2:** 'NLP is a part of AI.'

After performing basic text pre-processing (removing punctuation, converting to lowercase and tokenizing), the documents become:

- **Document 1:** [ai, is, a, fun, subject]
- **Document 2:** [nlp, is, a, part, of, ai]

**Questions:**

- (a) Create the dictionary (vocabulary) of unique words from both documents.
- (b) Construct the document vector for **Document 2** using the dictionary.
- (c) Explain what the numbers in the document vector (from part b) represent.
- (d) What is the primary purpose of converting text into these numerical vectors?

