

**Marking Scheme**  
**Strictly Confidential**  
**(For Internal and Restricted use only)**  
**Secondary School Examination, 2026 (Xth)**

**SUBJECT NAME : Artificial Intelligence (417) (Q.P. CODE /Set No. 104/4)**

**General Instructions: -**

<b>1</b>	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
<b>2</b>	<b>“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in Newspaper/Website, etc. may invite action under various rules of the Board and IPC.”</b>
<b>3</b>	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one’s own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. <b>However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-X, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.</b>
<b>4</b>	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
<b>5</b>	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
<b>6</b>	Evaluators will mark ( ✓ ) wherever answer is correct. For wrong answer CROSS ‘X’ be marked. Evaluators will not put right ( ✓ ) while evaluating which gives an impression that answer is correct and no marks are awarded. <b>This is most common mistake which evaluators are committing.</b>
<b>7</b>	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.

8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note <b>“Extra Question”</b> .
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of <b>marks 50</b> has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the <u>reduced syllabus and number of questions in question paper</u> .
13	<p>Ensure that you do not make the following common types of errors committed by the Examiner in the past:-</p> <ul style="list-style-type: none"> <li>• Leaving answer or part thereof unassessed in an answer book.</li> <li>• Giving more marks for an answer than assigned to it.</li> <li>• Wrong totaling of marks awarded on an answer.</li> <li>• Wrong transfer of marks from the inside pages of the answer book to the title page.</li> <li>• Wrong question wise totaling on the title page.</li> <li>• Wrong totaling of marks of the two columns on the title page.</li> <li>• Wrong grand total.</li> <li>• Marks in words and figures not tallying/not same.</li> <li>• Wrong transfer of marks from the answer book to online award list.</li> <li>• Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answers.)</li> <li>• Half or a part of the answer marked correct and the rest as wrong, but no marks awarded.</li> </ul>
14	While evaluating the answer books, if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15	Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16	The Examiners should acquaint themselves with the guidelines given in the <b>“Guidelines for Spot Evaluation”</b> before starting the actual evaluation.
17	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
18	The candidates are entitled to obtain a photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

**General Instructions:**

- (i) Please read the instructions carefully.
- (ii) This Question Paper consists of **21** questions in **two** sections: **Section-A & Section-B**.
- (iii) **Section-A** has Objective Type Questions, whereas **Section- B** contains Subjective Type Questions.
- (iv) 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.
- (v) All questions of a particular section must be attempted in the correct order.
- (vi) **SECTION-A: Objective Type Questions (24 Marks):**
  - (a) This section has **5** questions.
  - (b) There is no negative marking.
  - (c) Do as per the instructions given.
  - (d) Marks allotted are mentioned against each question/part.
- (vii) **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.

		<b>SECTION - A</b> <b>(Objective Type Questions)</b>	
1.		<b>Answer any 4 out of the given 6 questions on Employability skills :</b>	<b>4 x 1 = 4</b>
	(i)	Identify the imperative sentence: (A) Shut the front door.                      (B) She is talented artist. (C) Are you feeling better ?              (D) You were amazing !	1
	Ans	(A) <b>OR</b> Shut the front door.	

		<b><i>(1 Mark for the correct answer)</i></b>	
	(ii)	Breaking down big goals into smaller parts will make the goal _____. (A) specific (B) measurable (C) achievable (D) realistic	1
	Ans	(C) <b>OR</b> achievable <b><i>(1 Mark for the correct answer)</i></b>	
	(iii)	Define the term 'Time Management'.	1
	Ans	Time management is the ability to plan and control how you spend the hours of your day well and do all that you want to do. <b>OR</b> Prioritise the things you have to do. <b>OR</b> Remove waste and redundancy from work. <b>OR</b> Make a time table and follow it diligently. <b><i>(1 Mark for any correct/relevant answer)</i></b>	
	(iv)	What should a strong password consist of ? (A) Only letters (B) Numbers and special characters (C) Name of a person (D) Letters, numbers and special characters	1
	Ans	(D) <b>OR</b> Letters, numbers and special characters <b><i>(1 Mark for the correct answer)</i></b>	
	(v)	A misconception about an entrepreneur is : Entrepreneurs are _____, not _____.	1
	Ans	born , made <b>OR</b> rich, poor	

		<p><b>OR</b> unique, common <b>OR</b> big businessmen, small businessmen</p> <p><b>(1 Mark for any correct / relevant answer)</b></p>	
	(vi)	<p>Choose the option which is NOT a Sustainable Development Goal according to United Nations.</p> <p>(A) Population (B) No poverty (C) Quality education (D) Reduced Inequalities</p>	1
	Ans	<p>(A) <b>OR</b> Population</p> <p><b>(1 Mark for the correct answer)</b></p>	
2.		Answer any 5 out of the given 6 questions :	5 X 1 = 5
	(i)	<p>Anita and Surjit are creating an AI application that will classify different types of fruits. The Computer Vision task that will identify the type of fruit and assign a label to it is called _____.</p> <p>(A) Segmentation (B) Classification (C) Classification + Localization (D) Object Detection</p>	1
	Ans	<p>(B) <b>OR</b> Classification</p> <p><b>(1 Mark for the correct answer)</b></p>	
	(ii)	<p>Consider the following sentence :</p> <p>On seeing her son's result, Pooja's face turned red with anger.</p> <p>The word "red" demonstrates which characteristic of natural language ?</p> <p>(A) Redundancy (B) Context-dependent meaning (C) Grammatical structure (D) Temporal change</p>	1

	Ans	(B) <b>OR</b> Context-dependent meaning  <i>(1 Mark for the correct answer)</i>	
	(iii)	Ethical frameworks are primarily designed to : (A) Increase the efficiency of AI algorithms. (B) Ensure that choices made do not cause unintended harm. (C) Reduce the cost of AI development. (D) Speed up the AI project cycle.	1
	Ans	(B) <b>OR</b> Ensure that choices made do not cause unintended harm.  <i>(1 Mark for the correct answer)</i>	
	(iv)	<b>Statement 1</b> : Overfitting occurs when a model memorizes the training data rather than learning patterns. <b>Statement 2</b> : Using the same data for training and evaluation helps the model give accurate results. (A) Both statements are correct. (B) Both statements are incorrect. (C) Statement 1 is correct but statement 2 is incorrect. (D) Statement 1 is incorrect but statement 2 is correct.	1
	Ans	(C ) Statement 1 is correct but Statement 2 is incorrect. <b>OR</b> (A) Both statements are correct. (As individual statements, both statement 1 and statement 2 are also correct)  <i>(1 Mark for the correct answer)</i>	
	(v)	Which learning approach would be most suitable for training an AI model to park the car correctly ? (A) Supervised Learning (B) Unsupervised Learning (C) Transfer Learning (D) Reinforcement Learning	1

	Ans	(D) <b>OR</b> Reinforcement Learning  <i>(1 Mark for the correct answer)</i>	
	(vi)	Which stage of the AI Project Cycle involves testing the model on newly fetched data ?  (A) Data Exploration                      (B) Modelling (C) Evaluation                              (D) Deployment	1
	Ans	(C) <b>OR</b> Evaluation  <i>(1 Mark for the correct answer)</i>	
3.		Answer any 5 out of the given 6 questions :	5 X 1 = 5
	(i)	In the context of autonomous vehicle safety systems, which type of error would be most critical to minimize ?  (A) False Positive (detecting danger when there isn't any) (B) False Negative (failing to detect actual danger) (C) True Positive (detecting danger correctly) (D) True Negative (correctly identifying that there is no danger)	1
	Ans	(B) <b>OR</b> False Negative (failing to detect actual danger)  <i>(1 Mark for the correct answer)</i>	
	(ii)	What is the range of possible pixel values in a byte image format ?  (A) 0 to 100                      (B) 0 to 255 (C) 1 to 256                      (D) -128 to 127	1
	Ans	(B) <b>OR</b> 0 to 255  <i>(1 Mark for the correct answer)</i>	

	(iii)	An e-commerce platform analyzes customer purchase patterns to recommend “Customers who bought product X also bought product Y.” This uses : (A) Classification model (B) Regression model (C) Association model (D) Clustering model	1
	Ans	(C) <b>OR</b> Association model  <i>(1 Mark for the correct answer)</i>	
	(iv)	As AI is essentially being used as a decision making / influencing tool, we need to ensure that AI makes morally acceptable recommendations. Which of the following is a key factor that can knowingly or unknowingly influences our decision-making while designing an AI model ? (A) Intuition and Values                      (B) Algorithm efficiency (C) Data storage capacity                      (D) Processing speed	1
	Ans	(A) <b>OR</b> Intuition and Values  <i>(1 Mark for the correct answer)</i>	
	(v)	Which NLP application helps in converting natural speech into text in real time ? (A) Keyword Extraction tool (B) Translation of books from English to Hindi language (C) Auto generated captions on YouTube (D) Classifying raw text into pre-defined groups	1
	Ans	(C) <b>OR</b> Auto generated captions on YouTube  <i>(1 Mark for the correct answer)</i>	



	(vi)	In supervised learning, what is the purpose of the testing dataset ? (A) To train the model. (B) To evaluate the model's accuracy. (C) To create new features. (D) To label the data.	1
	Ans	(B) <b>OR</b> To evaluate the model's accuracy.  <i>(1 Mark for the correct answer)</i>	
4.		Answer any 5 out of the given 6 questions :	5 x 1 = 5
	(i)	In a fire alarm system, if the model predicts "Fire Present" when there is actually no fire, this is classified as : (A) True Positive (TP)                      (B) True Negative (TN) (C) False Positive (FP)                      (D) False Negative (FN)	1
	Ans	(C) <b>OR</b> False Positive (FP)  <i>(1 Mark for the correct answer)</i>	
	(ii)	<b>Assertion (A):</b> Bioethics is an example of a Value-based Framework for AI. <b>Reason (R) :</b> Bioethics deals with ethical issues related to health, medicine, and biological sciences. (A) Both (A) and (R) are true and (R) is the correct explanation of (A). (B) Both (A) and (R) are true, but (R) is not the correct explanation of (A). (C) (A) is true, but (R) is false. (D) (A) is false, but (R) is true.	1
	Ans	(D) <b>OR</b> (A) is false, but (R) is true.  <i>(1 Mark for the correct answer)</i>	
	(iii)	Which scenario best represents a regression problem ? (A) Identifying whether an email is spam.	1

		(B) Grouping customers by behaviour. (C) Predicting tomorrow's temperature. (D) Recognizing faces in photos.	
	Ans	(C) <b>OR</b> Predicting tomorrow's temperature.  <i>(1 Mark for the correct answer)</i>	
	(iv)	Which of the following best describes the relationship between pixels and image resolution ?  (A) More pixels result in lower image quality. (B) Pixels and resolution are unrelated concepts. (C) Resolution depends only on image file size. (D) The number of pixels in an image is known as resolution.	1
	Ans	(D) <b>OR</b> The number of pixels in an image is known as resolution.  <i>(1 Mark for the correct answer)</i>	
	(v)	Precision is defined as :  (A) The ratio of correctly predicted positive observations to total observations. (B) The ratio of correctly predicted positive observations to total predicted positive observations. (C) The ratio of correctly predicted negative observations to total observations. (D) The harmonic mean of true positives and true negatives.	1
	Ans	(B) <b>OR</b> The ratio of correctly predicted positive observations to total predicted positive observations.  <i>(1 Mark for the correct answer)</i>	
	(vi)	Which type of chat bot requires coding and works on bigger databases directly ?	1

		(A) Script bot (B) Smart bot (C) Traditional bot (D) Rule-based bot	
	Ans	(B) <b>OR</b> Smart bot  <i>(1 Mark for the correct answer)</i>	
5.		Answer any 5 out of the given 6 questions :	5 x 1=5
	(i)	Which AI domain would be most suitable for developing a price comparison website ? (A) Computer Vision (B) Natural Language Processing (C) Statistical Data (D) Robotics	1
	Ans	(C) <b>OR</b> Statistical Data  <i>(1 Mark for the correct answer)</i>	
	(ii)	<b>Assertion (A):</b> Converting text to lowercase is preferable in text preprocessing. <b>Reason (R) :</b> It ensures that “Hello” and “hello” are treated as the same word by the machine. (A) Both (A) and (R) are true and (R) is the correct explanation of (A). (B) Both (A) and (R) are true, but (R) is not the correct explanation of (A). (C) (A) is true, but (R) is false. (D) (A) is false, but (R) is true.	1
	Ans	(A) <b>OR</b> Both (A) and (R) are true and (R) is the correct explanation of (A).  <i>(1 Mark for the correct answer)</i>	

	(iii)	<p>In the context of Computer Vision vs Image Processing, which statement correctly differentiates them ?</p> <p>(A) Computer Vision and Image Processing are exactly the same.</p> <p>(B) Computer Vision enhances the image while Image Processing does not.</p> <p>(C) Computer Vision is a superset of Image Processing.</p> <p>(D) Image Processing is a superset of Computer Vision.</p>	1
	Ans	<p>(C) <b>OR</b> Computer Vision is a superset of Image Processing.</p> <p><i>(1 Mark for the correct answer)</i></p>	
	(iv)	<p>State True or False :</p> <p>In machine learning, the error is used to see how accurately the model can predict data.</p>	1
	Ans	<p>True/T</p> <p><i>(1 Mark for the correct answer)</i></p>	
	(v)	<p>A company wants to analyze customer reviews to understand satisfaction levels. Which NLP application would be most suitable ?</p> <p>(A) Text classification</p> <p>(B) Sentiment analysis</p> <p>(C) Keyword extraction</p> <p>(D) Language translation</p>	1
	Ans	<p>(B) <b>OR</b> Sentiment analysis</p> <p><i>(1 Mark for the correct answer)</i></p>	
	(vi)	<p>An AI model was tested with 1000 test samples. If True Positive (TP)= 200, True Negative (TN) = 600, False Positive (FP) = 100, False Negative (FN) = 100, how many total predictions were correct ?</p> <p>(A) 300                      (B) 600</p> <p>(C) 800                      (D) 900</p>	1

	Ans	(C) OR 800  (1 Mark for the correct answer)	
--	-----	---	--

## SECTION - B

### (Subjective Type Questions)

Answer any 3 out of the given 5 questions on Employability Skills in 20-30 words

each.

3 x 2 = 6

6.	Write the 7 C's of communication.	2
Ans	<p>7 C's of communication:</p> <ul style="list-style-type: none"> <li>• Clear</li> <li>• Concise</li> <li>• Concrete</li> <li>• Correct</li> <li>• Coherent</li> <li>• Complete</li> <li>• Courteous</li> </ul> <p>(2 Marks for all 7 C's ) OR (1½ Marks for any 5-6 C's) OR (1 Mark for any 3-4 C's) OR (½ Mark for any 1-2 C's)</p>	
7 (a)	What is emotional intelligence ?	1
Ans	<p>Emotional intelligence is the ability to identify and manage one's own emotions, as well as the emotions of others. OR It involves using emotional data to guide thinking, behavior, and relationships, aiming for improved self-awareness, empathy, and conflict resolution. OR It comprises five key components: self-awareness, self-regulation, motivation, empathy, and social skills. (1 mark for any correct answer)</p>	

7 (b)	Name any two skills included in emotional intelligence.	1
Ans	<ul style="list-style-type: none"> <li>• Emotional awareness</li> <li>• Managing emotions</li> <li>• Harnessing emotions</li> </ul> <p><i>(½ mark each for any 2 correct skills)</i></p>	
8.	How ICT skills help us in our day-to-day activities ?	2
Ans	<ul style="list-style-type: none"> <li>• ICT (Information and Communication Technology) skills help us to communicate, run our business and stay connected with our family and friends.</li> <li>• ICT skills (Information and Communication Technology) enhance daily life by enabling instant communication, efficient information access, and streamlined task management.</li> <li>• ICT (Information and Communication Technology) skills facilitate online shopping, digital banking, remote work, and entertainment.</li> <li>• ICT (Information and Communication Technology) skills help in improving education through e-learning and enhancing healthcare via Telemedicine.</li> </ul> <p><i>(2 marks for any two correct / relevant activities)</i>  OR  <i>(1 mark for any one correct / relevant activity)</i></p>	
9.	State the qualities to become a successful entrepreneur.	2
Ans	<ul style="list-style-type: none"> <li>• Confident</li> <li>• Keep trying new idea</li> <li>• Patience</li> <li>• Creative</li> <li>• Responsible</li> <li>• Decision making</li> <li>• Hard working</li> <li>• Problem solving</li> <li>• Risk Taking</li> <li>• Do not give up</li> </ul> <p><i>(2 marks for any two correct / relevant answer)</i>  OR  <i>(1 mark for any one correct / relevant answer)</i></p>	

10.	Define the term 'Sustainable Development'.	2
Ans	<p>Sustainable Development is the development that satisfies the needs of the present without compromising the capacity of future generations, guaranteeing the balance between economic growth, care for the environment and social well-being.</p> <p><b>OR</b></p> <p>Development that meets current needs without destroying resources for the future.</p> <p><b>OR</b></p> <p>Sustainable Development protects the environment from degradation like pollution, deforestation and resource depletion.</p> <p><b>(2 marks for any correct / relevant answer)</b></p>	

Answer any 4 out of the given 6 questions in 20-30 words each.

4 x2 = 8

11.	Explain the difference between sector-based and value-based ethical frameworks with one example of each.	2
Ans	<p><b>Sector-based ethical Frameworks (Any one):</b></p> <ul style="list-style-type: none"> <li>• These are frameworks tailored to specific sectors or industries.</li> <li>• Different sectors face different ethical challenges.</li> <li>• Sector-based ethical frameworks may also apply to domains such as finance, education, transportation, agriculture, governance, and law enforcement.</li> </ul> <p><b>Example :</b> Bioethics (focuses on ethical considerations in healthcare, patient privacy, data security).</p> <p><b>Value-based ethical Frameworks (Any one):</b></p> <ul style="list-style-type: none"> <li>• Value-based frameworks focus on fundamental ethical principles and values guiding decision making.</li> <li>• It reflects the different moral philosophies that inform ethical reasoning.</li> <li>• Value-based frameworks are concerned with assessing the moral worth of actions and guiding ethical behaviour.</li> </ul> <p><b>Example :</b> Rights-based framework (valuing human life over other considerations), Virtue-Based(Whether developers uphold ethical values), Utility-Based(Maximize overall good).</p> <p><b>(1 mark for any one difference and ½ mark for each example)</b></p>	
12.	Give any two characteristics of a Classification Model.	2

Ans	<p>Characteristics of a Classification Model (<b>any two</b>):</p> <ul style="list-style-type: none"><li>• It is a type of Supervised Learning model.</li><li>• The data is classified according to the labels.</li><li>• The model works on a discrete data set which means the data need not be continuous.</li></ul> <p>Example: In the grading system, students are classified on the basis of the grades they obtain with respect to their marks in the examination.</p> <p><b>(1 mark each for any correct / relevant Characteristic )</b></p>													
13.	How do computers store RGB images ?	2												
Ans	<ul style="list-style-type: none"><li>• All the colored images are made up of three primary colors Red, Green, and Blue. These colors can be made by combining different intensities of red, green, and blue.</li><li>• Every RGB image is stored in the form of three different channels called the R Channel, G Channel, and B Channel.</li><li>• Each plane separately has many pixels with each value varying from 0-255.</li><li>• This means that in an RGB image, each pixel has a set of three different values which together give color to that particular pixel.</li></ul> <p><b>(2 marks for any correct / relevant answer)</b></p>													
14.	Give two differences between Supervised and Unsupervised learning.	2												
Ans	<table><tr><th>Supervised Learning</th><th>Unsupervised Learning</th></tr><tr><td>Uses labelled data.</td><td>Uses un-labelled data.</td></tr><tr><td>Predicts accurate outcomes or classifies data based on known labels.</td><td>Discovers hidden patterns, structures, or groupings on unknown data.</td></tr><tr><td>Less complex, as the model learns from labelled data with clear guidance.</td><td>More complex as unsorted and messy data is used for input.</td></tr><tr><td>User supervision/intervention is required.</td><td>No user supervision/intervention is required.</td></tr><tr><td>Types : Classification or Regression.</td><td>Types : Clustering, Association, Anomaly Detection, Dimensionality Reduction.</td></tr></table>	Supervised Learning	Unsupervised Learning	Uses labelled data.	Uses un-labelled data.	Predicts accurate outcomes or classifies data based on known labels.	Discovers hidden patterns, structures, or groupings on unknown data.	Less complex, as the model learns from labelled data with clear guidance.	More complex as unsorted and messy data is used for input.	User supervision/intervention is required.	No user supervision/intervention is required.	Types : Classification or Regression.	Types : Clustering, Association, Anomaly Detection, Dimensionality Reduction.	
Supervised Learning	Unsupervised Learning													
Uses labelled data.	Uses un-labelled data.													
Predicts accurate outcomes or classifies data based on known labels.	Discovers hidden patterns, structures, or groupings on unknown data.													
Less complex, as the model learns from labelled data with clear guidance.	More complex as unsorted and messy data is used for input.													
User supervision/intervention is required.	No user supervision/intervention is required.													
Types : Classification or Regression.	Types : Clustering, Association, Anomaly Detection, Dimensionality Reduction.													



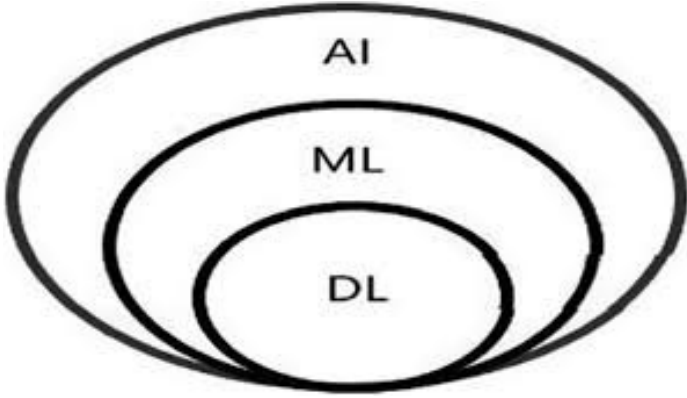
	<table><tr><td>Example- Spam Email,Fraud Detection, Predicting house prices.</td><td>Example- Customer Segmentation, Identifying products often brought together, Grouping shopping behaviour.</td></tr></table> <p><i>(1 mark for each correct difference (Any two))</i> <i>(½ mark each for any correct example, if only example is given)</i></p>	Example- Spam Email,Fraud Detection, Predicting house prices.	Example- Customer Segmentation, Identifying products often brought together, Grouping shopping behaviour.					
Example- Spam Email,Fraud Detection, Predicting house prices.	Example- Customer Segmentation, Identifying products often brought together, Grouping shopping behaviour.							
15.	Explain Train-test split technique with respect to machine learning algorithm.	2						
Ans	<p>Train-test split :</p> <ul style="list-style-type: none"><li>• The train-test split is a technique for evaluating the performance of a machine learning algorithm.</li><li>• It can be used for any supervised learning model.</li><li>• The procedure involves taking a dataset and dividing it into two subsets:<ul style="list-style-type: none"><li>◦ The training dataset : Used to make the model learn.</li><li>◦ The testing dataset : Used to evaluate the model’s performance on new, unseen data.</li></ul></li><li>• The train-test procedure is appropriate when there is a sufficiently large dataset available.</li><li>• The ratio of training and testing dataset should be 80-20% or 70-30 %.</li><li>• The objective is to estimate the performance of the machine learning model on new data: data not used to train the model.</li></ul> <p><i>(2 marks for any correct/relevant answer )</i></p>							
16.	How is Stemming different from Lemmatization ? Explain how the word “Wolves” would be processed by stemming and lemmatization.	2						
Ans	<table><tr><th>Stemming</th><th>Lemmatization</th></tr><tr><td>It is the process in which the affixes of words are removed and the words are converted to their base form.The resultant stem word may/may not be meaningful.</td><td>It is the process in which the affixes of words are removed and the words are converted to their base form.The resultant Lemma word is always meaningful.</td></tr><tr><td>Stemming takes less time than lemmatization.</td><td>It takes longer time to execute than stemming</td></tr></table> <p>Input Word : Wolves</p>	Stemming	Lemmatization	It is the process in which the affixes of words are removed and the words are converted to their base form.The resultant stem word may/may not be meaningful.	It is the process in which the affixes of words are removed and the words are converted to their base form.The resultant Lemma word is always meaningful.	Stemming takes less time than lemmatization.	It takes longer time to execute than stemming	
Stemming	Lemmatization							
It is the process in which the affixes of words are removed and the words are converted to their base form.The resultant stem word may/may not be meaningful.	It is the process in which the affixes of words are removed and the words are converted to their base form.The resultant Lemma word is always meaningful.							
Stemming takes less time than lemmatization.	It takes longer time to execute than stemming							

	<p><b>Stemming Output : Wolv</b> (may not be meaningful)</p> <p><b>Lemmatization Output : Wolf</b> (meaningful word)</p> <p><b>(1 mark for correct difference (any one))</b>  <b>(½ mark for correct Stem word)</b>  <b>(½ mark for correct Lemma word)</b></p>	
--	---	--

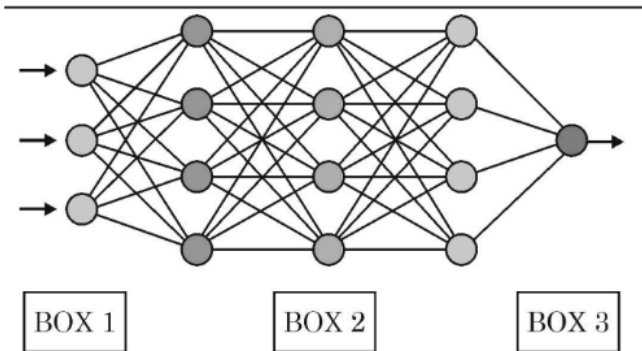
Answer any 3 out of the given 5 questions in 50- 80 words each

3 x 4 = 12

17.	Differentiate between Deep Learning, Artificial Intelligence and Machine Learning. Also draw a labelled Venn diagram depicting the relationship between AI, ML and DL.	4
Ans	<p><b>Artificial Intelligence or AI</b> for short, refers to any technique that enables computers to mimic human intelligence. An artificially intelligent machine works on algorithms and data fed to it and gives the desired output.</p> <p>Example of AI:</p> <ul style="list-style-type: none"> <li>• A chess-playing system like Deep Blue (IBM's system that defeated Garry Kasparov)</li> <li>• Virtual assistants like Siri</li> <li>• Rule-based expert systems in medical diagnosis</li> </ul> <p><b>Machine Learning, or ML</b> for short, enables machines to improve at tasks with experience. The machine here learns from the new data fed to it while testing and uses it for the next iteration. It also takes into account the times when it went wrong and considers the exceptions.</p> <p>Example of ML:</p> <ul style="list-style-type: none"> <li>• Email spam detection</li> <li>• Movie recommendations like those used by Netflix</li> <li>• Fraud detection systems</li> </ul> <p><b>Deep Learning or DL</b> for short, enables software to train itself to perform tasks with vast amounts of data. Since the system has got huge set of data, it is able to train itself with the help of multiple machine learning algorithms working together to perform a specific task.</p> <p>Example of DL:</p> <ul style="list-style-type: none"> <li>• Image recognition in self-driving cars</li> <li>• Face recognition systems</li> <li>• Language models like ChatGPT</li> </ul>	

		<p>Artificial Intelligence is the umbrella term which holds both Deep Learning as well as Machine Learning.</p> <p>Deep Learning, on the other hand, is the very specific learning approach which is a subset of Machine Learning as it comprises of multiple Machine Learning algorithms.</p>  <p><i>(1 mark for each correct answer / difference)</i>  <i>(1 mark for correct venn diagram)</i></p>	
18.		Consider the following scenarios and identify which AI domain would be most appropriate for each, with justification :	4
Ans	(A)	An AI based education platform needs to translate to English language and analyze thousands of student essays to provide instant feedback on grammar, content quality and writing style.	
		<p>AI Domain : Natural Language Processing (NLP)</p> <p>Justification : Essay translation involves change of language and analysis involves understanding text, grammar checking, and content evaluation, which are core NLP applications.</p> <p><i>(1 mark for correct identification of AI domain)</i>  <i>(1 mark for correct / relevant justification)</i></p>	
Ans	(B)	An AI based application installed on a busy crossing in a metropolitan city scans all vehicles driving through that crossing during peak traffic hours and categorizes them into four wheelers and two wheelers.	
		<p>AI Domain : Computer Vision</p> <p>Justification : The system analyzes visual data (images/videos from cameras) to identify and classify vehicles. Since it processes and interprets images, it falls under Computer Vision.</p> <p><i>(1 mark for correct identification of AI domain)</i>  <i>(1 mark for correct / relevant justification)</i></p>	

19.		Read the following paragraph and answer the questions that follow : PQR Security Solutions has designed an AI Model to detect cyber attacks on E-Commerce websites. For this, various network activities were monitored and analyzed on one of the websites. The model was tested on a dataset of 1500 network activities. Out of these, the model correctly predicted that 1000 were cyber attacks. It also correctly identified that 250 were not cyber attacks. However, the model predicted that 200 were cyber attacks but actually they were not. Additionally, it predicted that 50 were not cyber attacks but they actually were.																											
	(A)	Draw the confusion matrix based on the given scenario.	2																										
Ans	(A)	<table border="1"> <tr> <th colspan="2" rowspan="2">CONFUSION MATRIX</th><th colspan="2">REALITY</th></tr> <tr> <th>YES</th><th>NO</th></tr> <tr> <th rowspan="2">PREDICTION</th><th>YES</th><td>1000(TP)</td><td>200 (FP)</td></tr> <tr> <th>NO</th><td>50 (FN)</td><td>250(TN)</td></tr> </table> <p>OR</p> <table border="1"> <tr> <th colspan="2" rowspan="2">CONFUSION MATRIX</th><th colspan="2">PREDICTION</th></tr> <tr> <th>YES</th><th>NO</th></tr> <tr> <th rowspan="2">REALITY</th><th>YES</th><td>1000(TP)</td><td>50 (FN)</td></tr> <tr> <th>NO</th><td>200 (FP)</td><td>250(TN)</td></tr> </table> <p><i>(2 marks for drawing confusion matrix with all correct values at correct positions)</i></p> <p>OR</p> <p><i>(1 ½ mark for drawing confusion matrix with any 2 correct values at correct positions)</i></p> <p>OR</p> <p><i>(½ mark for drawing confusion matrix without/incorrect values)</i></p>	CONFUSION MATRIX		REALITY		YES	NO	PREDICTION	YES	1000(TP)	200 (FP)	NO	50 (FN)	250(TN)	CONFUSION MATRIX		PREDICTION		YES	NO	REALITY	YES	1000(TP)	50 (FN)	NO	200 (FP)	250(TN)	
CONFUSION MATRIX		REALITY																											
		YES	NO																										
PREDICTION	YES	1000(TP)	200 (FP)																										
	NO	50 (FN)	250(TN)																										
CONFUSION MATRIX		PREDICTION																											
		YES	NO																										
REALITY	YES	1000(TP)	50 (FN)																										
	NO	200 (FP)	250(TN)																										
Ans	(B)	How many total cases are True Negative in the above scenario ?	1																										
		True Negative (TN) : 250  <i>(1 mark for the correct answer)</i>																											
Ans	(C)	Calculate Precision.	1																										

		<p>TP = 1000, TN = 250, FP = 200, FN = 50</p> <p>Precision = <math>\frac{TP}{TP + FP}</math></p> <p>= <math>\frac{1000}{1200}</math></p> <p>= 0.833</p> <p>= 83.3 %</p> <p><i>(1 mark for the correct answer)</i></p> <p><b>OR</b></p> <p><i>(½ mark for writing correct formula but incorrect posting of values )</i></p> <p><b>OR</b></p> <p><i>(½ mark for writing formula only)</i></p> <p><b>NOTE- Mathematical calculations can be ignored</b></p>	
20.	(A)	Expand and define the terms CNN and ANN.	3
Ans	(A)	<p><b>Convolutional Neural Network (CNN)</b> - Convolutional Neural Network is a Deep learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. CNN is specially designed to process images by automatically extracting visual features.</p> <p><b>Artificial Neural Network (ANN)</b> - Artificial Neural networks are modelled on the human brain and nervous system. They are able to automatically extract features without input from the programmer. Every neural network node is essentially a machine learning algorithm. It is useful when solving problems for which the data set is very large.</p> <p><i>(½ mark each for the correct full form)</i></p> <p><i>(1 mark each for the correct definition / explanation / relevant answer )</i></p>	
	(B)	<p>In the diagram of neural network given below, identify the layer that should be depicted in Box 1 and Box 2 :</p>  <p>The diagram shows a neural network with four layers of nodes. The first layer has 3 nodes, the second has 4, the third has 4, and the fourth has 1. Arrows indicate the flow from left to right. Below the diagram are three boxes labeled BOX 1, BOX 2, and BOX 3.</p>	1

Ans	(b)	Box 1 : Input Layer Box 2 : Hidden Layer  <i>(½ mark each for the correct answer. No marks to be awarded for naming Box 3)</i>																															
21.		Consider the following documents :  <b>Document 1</b> : Data Science requires information. <b>Document 2</b> : Information analysis requires data.  Implement all the four steps of Bag of Words (BoW) model to create a document vector table.	4																														
Ans		<b>Step 1</b> : Text Processing (Preprocessing), after normalization : Document 1 : [data, science, requires, information] Document 2 : [information, analysis, requires, data]  <b>Step 2</b> : Create Dictionary (Vocabulary) Unique words :data, science, information, analysis, requires  <b>Step 3</b> : Create Document Vector Count frequency of each vocabulary word in Document 1  <table border="1"><tr><td></td><td>data</td><td>science</td><td>requires</td><td>information</td><td>analysis</td></tr><tr><td>Doc 1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>  <b>Step 4</b> : Create Document Vector table for all documents  <table border="1"><tr><td></td><td>data</td><td>science</td><td>requires</td><td>information</td><td>analysis</td></tr><tr><td>Doc 1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>Doc 2</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr></table>  <i>(1 mark for each correct step) (No mark to be deducted for combining Step 3 and Step 4)</i>		data	science	requires	information	analysis	Doc 1	1	1	1	1	0		data	science	requires	information	analysis	Doc 1	1	1	1	1	0	Doc 2	1	0	1	1	1	
	data	science	requires	information	analysis																												
Doc 1	1	1	1	1	0																												
	data	science	requires	information	analysis																												
Doc 1	1	1	1	1	0																												
Doc 2	1	0	1	1	1																												