

CBSE CLASS X

Artificial Intelligence (417)

ANSWER KEY

From previous CBSE Board Exam questions

Code: DY4OAC

Questions: 31

Maximum Marks: 60

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SELECTIONS USED

Source	Previous-year board
Subject	Artificial Intelligence
Lessons	Advanced Concepts of Modeling in AI
Year	2022-2026
Questions selected	31

Composition — Types: 12 MCQ · 8 Long · 6 Short · 2 true_false · 1 Assertion-reason

Q1. § Unit Overview § Reflection Time

[4]

Will it be valid to say that not all the devices which are termed as "smart" are AI-enabled? Justify this statement. Explain any two examples from the daily life which are commonly misunderstood as AI.

Previously asked in: 2023 104 Q20

◆ Revisiting AI Project Cycle & Ethical Frameworks for AI

1.2 Introduction to AI Domains

2.1 Revisiting AI, ML, DL

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Model Answer

Yes, it is valid to say that not all "smart" devices are AI-enabled.

"Smart" simply means a device can connect to the internet or perform automated tasks. AI, however, requires the ability to learn from data, make decisions, and improve over time. A device can be smart without having any AI capability.

Two commonly misunderstood examples:

1. **Smart TV** – A Smart TV connects to the internet and runs apps like Netflix or YouTube. It does not learn or make decisions on its own; it simply executes programmed functions. Hence, it is smart but not AI-enabled.
1. **Smart Street Lights** – These lights turn on/off automatically based on a timer or light sensor. This is pre-programmed automation, not AI, as no learning or data-based decision-making is involved.

Explanation

- The question tests whether you understand the **difference between "smart" (connected/automated) and "AI-enabled" (learns from data, makes decisions)**.
- CBSE examiners expect: one clear justification statement + two distinct, well-explained examples. Avoid listing examples without explaining *why* they are not AI.
- Do not confuse automation/connectivity with machine learning or intelligence — that distinction is the core of the answer.
- Keep each example to 2 lines: name it, describe what it does, state why it is NOT AI.

Q2. § 1.2: Introduction to AI Domains

[1]

Which of the following represents an example of a recommendation system ?

- (a) An online clothing store that offers a wide variety of clothing options.
- (b) A search engine that retrieves relevant web pages based on user queries.
- (c) An e-commerce website that displays customer reviews and ratings for products.
- (d) A music streaming platform that suggests songs and playlists based on user listening history.

Previously asked in: 2024 104 Q4 (iv)

♦ Revisiting AI Project Cycle & Ethical Frameworks for AI

1.2 Introduction to AI Domains

Collaborative Filtering / Recommendation Systems

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Model Answer

(d) A music streaming platform that suggests songs and playlists based on user listening history.

Explanation

A recommendation system suggests items to users based on their past behaviour or preferences. Option (d) directly matches this — the platform analyses listening history to suggest relevant songs. Options (a), (b), and (c) describe a product catalogue, a search engine, and a review display system respectively, none of which involve personalised recommendations. The textbook also cites Spotify/Netflix-style platforms as classic examples of recommendation systems using clustering/unsupervised learning.

Q3.

[2]

What is Dimensionality Reduction?

Previously asked in: 2023 104 Q12

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

Dimensionality Reduction is a technique used in **unsupervised learning** to reduce the number of features (dimensions) in a dataset while retaining the most important information. It helps simplify complex data, remove irrelevant or redundant features, and make the data easier to process and visualize, improving the efficiency of machine learning models.

Explanation

The source passages do not explicitly define Dimensionality Reduction — it is a standard unsupervised learning concept from the broader CBSE AI syllabus not covered in the provided extracts. Examiners expect students to mention: (1) it reduces the number of features/variables, (2) it retains important information, and (3) it is used to simplify data and improve model performance. Avoid writing lengthy paragraphs — two to three crisp sentences are sufficient for 2 marks.

Q4. § 2.1 Revisiting AI, ML, DL

[4]

Ms. Sooji is a beginner in the field of Artificial Intelligence. She got confused among the core terms like Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL). Many a times, these terms are used interchangeably but are they the same? Justify your answer. Help her in understanding these terms by drawing a well labelled diagram to depict the interconnection of these three fields.

Previously asked in: 2023 104 Q17

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

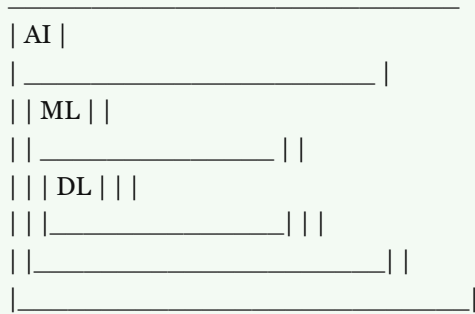
No, AI, ML, and DL are **not** the same — they are related but distinct terms:

- **Artificial Intelligence (AI):** Any technique that enables computers to mimic human intelligence. It is the broadest, umbrella term.
- **Machine Learning (ML):** A subset of AI. Enables machines to improve at tasks with experience by learning from new data and its own mistakes.
- **Deep Learning (DL):** A subset of ML. Enables software to train itself using vast amounts of data through multiple ML algorithms (e.g., ANN) working together. It is the most specific and advanced of the three.

Relationship: $AI \supset ML \supset DL$ (funnel approach — many AI applications, fewer ML, fewest DL).

Well-labelled Diagram (Venn/Nested):

...



...

Source: Chapter 2, Section 2.1 — Revisiting AI, ML, DL

Explanation

- Examiners expect a **clear distinction** of all three terms (definition + relationship), not just definitions alone.
- The diagram must be **nested/Venn-type** showing DL inside ML, ML inside AI — labelling all three circles is mandatory for full marks.
- The key phrase to remember: "**funnel approach**" — AI is widest, DL is narrowest.
- Do not say they are completely different; the answer must convey they are **related but not interchangeable**.

Q5. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § 2.2 Modelling § Test Yourself (MCQs and Assertion-Reasoning) [1]

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

Previously asked in: 2026 104 Q2 (v)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

(D) Reinforcement Learning — Parking a car involves trial-and-error decision-making where the AI learns by receiving rewards for correct actions and penalties for mistakes, which is the core of Reinforcement Learning.

Source: Chapter 2, Section 2.2 – Reinforcement Learning

Explanation

The textbook explicitly lists "Parking a car" as an example of Reinforcement Learning and states it "enables the computer to make a series of decisions that maximize a reward metric without human intervention." Supervised learning needs labelled data; unsupervised finds patterns; transfer learning is not covered as a main ML category here. Reinforcement Learning fits best because parking requires sequential decisions optimised through reward/penalty feedback.

Q6. § 2.1 Revisiting AI, ML, DL § 2.2 Modelling [1]

When a machine possesses the ability to mimic human traits, i.e., make decisions, predict the future, learn, and improve on its own, it is said to have :

- (a) Computational Skills
- (b) Learning Capability
- (c) Artificial Intelligence
- (d) Cognitive Processing

Previously asked in: 2024 104 Q5 (ii)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

(c) Artificial Intelligence

Explanation

The passage defines AI as "any technique that enables computers to mimic human intelligence," which includes making decisions, predicting, learning, and improving — exactly what the question describes. The other options are narrower concepts that fall *within* AI, not the umbrella term.

Q7. § 2.1 Revisiting AI, ML, DL

[2]

Differentiate between Machine Learning (ML) and Deep Learning (DL).

Previously asked in: 2024 104 Q11

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

| Basis | Machine Learning (ML) | Deep Learning (DL) |

|---|---|---|

| **Definition** | Enables machines to improve at tasks with experience; learns from mistakes. | Enables software to train itself using vast amounts of data with multiple ML algorithms. || **Data Requirement** | Works with relatively smaller datasets. | Requires huge/vast amounts of data. || **Algorithm** | Uses single ML algorithms; cannot develop its own. | Uses multiple ML algorithms (ANN/CNN); machines develop algorithms for themselves. || **Subset** | Subset of AI. | Subset of ML (more specific). |

Source: Chapter 2, Section 2.1 – Revisiting AI, ML, DL

Explanation

- Examiners expect a **tabular comparison** for "differentiate" questions — it earns full marks cleanly.
- Key contrast points: DL needs *vast* data, uses *multiple* ML algorithms working together, and is a *subset of ML*, whereas ML is a subset of AI.
- Remember the hierarchy: **AI** $\supset$ **ML** $\supset$ **DL** (funnel/Venn diagram concept).
- Avoid writing lengthy paragraphs for a 2-mark differentiation — 2–3 clear points in a table are sufficient.

Q8. § Test Yourself (MCQs and Assertion-Reasoning)**[2]**

For a healthcare organisation's objective of predicting disease outbreaks and efficiently allocating resources through the analysis of medical records, would you recommend using supervised learning or unsupervised learning as the preferred machine learning approach ? Explain your choice briefly.

Previously asked in: 2024 104 Q14

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer**Recommended approach: Supervised Learning**

For predicting disease outbreaks and allocating resources, **supervised learning** is preferred. The organisation has labeled medical records (patient diagnosis, outcomes, disease history), which serve as training data. The model learns patterns from this labeled data to make predictions — a core feature of supervised learning.

Unsupervised learning would be used only if no labels existed and the goal was merely to discover unknown patterns.

Source: Chapter 2, Section 2.2 – Supervised Learning

Explanation

- Examiners expect you to **name the approach** and **justify using the key concept** (labeled vs. unlabeled data).
- The trigger words in this question are "*predicting*" (a supervised task) and "*medical records*" (existing labeled data — diagnoses, outcomes).
- Mentioning why the other approach (unsupervised) is *not* suitable adds a contrast point and strengthens the answer within the word limit.
- Do not over-explain; two focused points are enough for 2 marks.

Q9. § Test Yourself (MCQs and Assertion-Reasoning)

[2]

Give two differences between Supervised and Unsupervised learning.

Previously asked in: 2026 104 Q14

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

Basis	Supervised Learning	Unsupervised Learning
Data	Uses **labeled** data for training.	Uses **unlabeled** data for training.
Goal	Predicts a specific output (classification/regression).	Discovers hidden patterns or clusters in data.
Example: Spam email filter (Supervised) vs. Customer grouping/clustering (Unsupervised).

Source: Chapter 2, Section 2.2 – Modelling

Explanation

- Examiners look for the **two clear differences** — the most scoring points are **labeled vs. unlabeled data** and **predict output vs. discover patterns**.
- Presenting differences in a **table format** is preferred for "differentiate" questions — it earns full marks neatly.
- Adding a one-line example for each is optional but shows understanding and can secure boundary marks.
- Avoid writing long paragraphs; two crisp rows in a table are sufficient for 2 marks.

Q10. § 2.1 Revisiting AI, ML, DL

[4]

Differentiate between Deep Learning, Artificial Intelligence and Machine Learning. Also draw a labelled Venn diagram depicting the relationship between AI, ML and DL.

Previously asked in: 2026 104 Q17

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

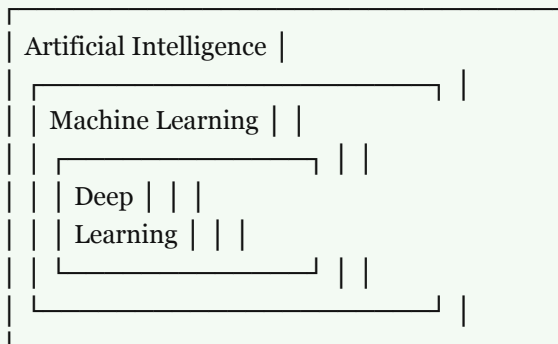
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Model Answer**Differentiation:**

Basis	Artificial Intelligence (AI)	Machine Learning (ML)	Deep Learning (DL)
Definition	Technique that enables computers to mimic human intelligence	Enables machines to improve at tasks with experience	Enables software to train itself using vast amounts of data
Scope	Broadest – umbrella term	Subset of AI	Subset of ML
Data needed	Works on algorithms and data fed to it	Learns from new data in each iteration	Requires huge/vast amounts of data
Algorithm	Predefined	Machine learns its own rules	Uses multiple ML algorithms (e.g., ANN)

Venn Diagram:

...



...

- **AI** is the outermost/umbrella concept.
- **ML** is a subset of AI.
- **DL** is a subset of ML (uses multiple ML algorithms working together).

Source: Chapter 2, Section 2.1 – Revisiting AI, ML, DL

Explanation

- Examiners expect a **clear table** for differentiation (3 rows of differences = ~2 marks) and a **labelled nested Venn diagram** (~2 marks). Both parts are compulsory.
- Key phrase to remember: $AI \supset ML \supset DL$ (nested/funnel relationship).
- The diagram must be **labelled** with all three terms clearly shown as concentric/nested shapes — marks are awarded for labels.
- Do not mix up DL and ML definitions: DL uses *vast data + multiple ML algorithms*, while ML *learns from experience/feedback*.

Q11. § 2.2 Modelling § Test Yourself (MCQs and Assertion-Reasoning) § Reflection Time

[1]

Assertion (A) : When a machine is able to mimic human traits, it is said to be artificially intelligent.

Reason (R) : A fully automatic washing machine is artificially intelligent.

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(B) Both (A) and (R) are correct and (R) is not the correct explanation of (A).

(C) (A) is correct but (R) is not correct.

(D) (A) is not correct but (R) is correct.

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(B) Both (A) and (R) are correct and (R) is not the correct explanation of (A).

(C) (A) is correct but (R) is not correct.

(D) (A) is not correct but (R) is correct.

Previously asked in: 2024 104 Q2 (i)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

(C) (A) is correct but (R) is not correct.

Assertion is correct: AI refers to any technique that enables computers to mimic human intelligence. However, a fully automatic washing machine only follows pre-set programmed instructions and does not mimic human intelligence, so it is **not** artificially intelligent.

Explanation

- The textbook defines AI as techniques that enable computers to **mimic human intelligence** — so Assertion (A) is true.
- A fully automatic washing machine operates on fixed, pre-programmed rules (it does not learn, adapt, or mimic human traits), so Reason (R) is false.
- Examiners expect students to distinguish between automated/programmable machines and genuinely AI-enabled machines. This is a standard trap in assertion-reason questions on this topic.

Q12. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § Activity 1: Human Neural Network – The Game § Reflection Time [1]

Which form of learning-based approach does the following diagram indicate ?

- (A) Clustering
- (B) Classification
- (C) Regression
- (D) Dimensionally Reduction

Previously asked in: 2024 104 Q4 (iv)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

(B) Classification

A diagram showing data points sorted into predefined labeled categories represents a **Classification** model, which is a supervised learning approach that assigns inputs to discrete classes.

Explanation

- **Classification** uses labeled data and assigns outputs to distinct categories (e.g., spam/not spam, hot/cold). The diagram typically shows data divided into separate labeled groups/categories.
- **Clustering** (unsupervised) finds groups without predefined labels — eliminate if the diagram shows labeled categories.
- **Regression** predicts continuous values — eliminate if the diagram doesn't show a trend line or continuous output.
- Key examiner tip: Look at whether the groups/outputs are **labeled and predefined** (→ Classification) or **discovered by the model** (→ Clustering).

Q13. § 2.1 Revisiting AI, ML, DL § 2.2 Modelling

[1]

Musical intelligence is a concept that

- (A) assesses one's ability to regulate, measure and understand numerical symbols, abstraction and logic.
- (B) measures the language processing skills both in terms of understanding or implementation in writing or verbally.
- (C) evaluates the ability to process information on the environment around us.
- (D) describes a person's ability to recognize and create sounds, rhythms and sound patterns.

Previously asked in: 2024 104 Q5 (i)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

(D) Musical intelligence describes a person's ability to recognize and create sounds, rhythms and sound patterns.

Explanation

This is a direct factual recall question. Option (D) is correct as it matches the standard definition of musical intelligence (one of Howard Gardner's multiple intelligences). The source passages focus on AI/ML concepts and do not define musical intelligence, but among the options, (D) is the only one that correctly describes musical intelligence — the others describe logical-mathematical (A), linguistic (B), and naturalist (C) intelligences respectively.

Q14. § 2.1 Revisiting AI, ML, DL § 2.2 Modelling § Test Yourself (MCQs and Assertion-Reasoning)

[1]

State True/False : Machine learning and Deep learning are part of Artificial Intelligence, but not everything that is Machine learning will be Deep learning.

Previously asked in: 2025 104/S Q2 (iii)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

True. ML and DL are both subsets of AI, but DL is a specific subset of ML (not all ML is DL), as DL uses multiple ML algorithms together to train on vast data.

Source: Chapter 2, Section 2.1 – Revisiting AI, ML, DL

Explanation

The Venn diagram in the textbook shows AI as the outermost circle, ML inside it, and DL as the innermost circle within ML. This confirms: all DL is ML, but not all ML is DL. Examiners expect you to state "True" and briefly justify using the subset relationship.

Q15. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § 2.2 Modelling

[1]

In this learning model, the data set which is fed to the machine is labelled. Name the model.

Previously asked in: 2023 104 Q4 (vi)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

The model is **Supervised Learning**. In this model, the dataset fed to the machine is labelled, meaning the data has tags/information attached to it used for training.

Source: Chapter 2, Section 2.2 – Supervised Learning

Explanation

The key phrase in the question is "labelled data." Examiners expect you to directly name **Supervised Learning** and briefly justify it by linking labelled data to this model. Do not confuse it with Unsupervised Learning (unlabelled data) or Reinforcement Learning (reward-based). Just one line is sufficient for 1 mark.

Q16. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § 2.2 Modelling § Test Yourself (MCQs and Assertion-Reasoning) [1]

It refers to the unsupervised learning algorithm which can cluster the unknown data according to the patterns or trends identified out of it.

- (a) Regression
- (b) Classification
- (c) Clustering
- (d) Dimensionality reduction

Previously asked in: 2023 104 Q5 (v)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

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Model Answer

(c) Clustering

Explanation

Clustering is an unsupervised learning algorithm that groups unlabeled/unknown data based on patterns or similarities the model identifies on its own — no predefined labels are used. Regression and Classification are supervised learning types; Dimensionality Reduction is a different unsupervised technique.

Q17. § 2.3 Artificial Neural Networks

[1]

In a neural network, what is the function of the input layer?

- (A) It performs mathematical operations on the input data.
- (B) It connects neurons to the output layer for predictions.
- (C) It receives and passes the raw input data to the hidden layers.
- (D) It stores weights and biases for neural network training.

Previously asked in: 2025 104/S Q5 (ii)

♦ Advanced Concepts of Modeling in AI

2.3 Artificial Neural Networks

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Model Answer

(C) It receives and passes the raw input data to the hidden layers.

The input layer is the first layer of a neural network. Its job is to acquire data and feed it to the network; **no processing occurs** at the input layer.

Source: Chapter 2, Section 2.3 Artificial Neural Networks

Explanation

The passage explicitly states: *"The job of an input layer is to acquire data and feed it to the Neural Network. No processing occurs at the input layer."* This rules out options (A) and (D). Option (B) describes the output layer's role, not the input layer. Examiners expect you to recall that the input layer only receives and forwards raw data — all computation happens in the hidden layers.

Q18. § Test Yourself (MCQs and Assertion-Reasoning)**[4]**

Explain the following with respect to Unsupervised Learning Models :

- (a) Clustering
- (b) Dimensionality Reduction

Previously asked in: 2025 104/S Q18

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

2.2 Modelling

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Model Answer

(a) Clustering (2 marks)

Clustering is an **unsupervised learning** model that groups unlabeled data into clusters based on similarities or patterns identified by the machine.

- The model finds similar data points and places them in the same cluster, differentiating them from objects in other clusters.
- No predefined class labels are given; the machine discovers groups on its own.
- **Example:** A supermarket customer database is clustered into "grocery shoppers" and "non-grocery shoppers" without any prior labels. OTT platforms like Netflix use clustering for recommendations.

(b) Dimensionality Reduction (2 marks)

Dimensionality Reduction is an unsupervised learning technique used to reduce the number of features (dimensions) in a dataset while retaining important patterns and relationships.

- It helps simplify large, complex datasets, making them easier to process and visualize.
- It removes redundant or irrelevant features, improving model efficiency.
- **Example:** Compressing pixel data of images while preserving key features for pattern recognition.

Source: Chapter 2, Section 2.2 – Sub-categories of Unsupervised Learning Model

Explanation

- **Clustering** is directly covered in the source passages with examples — always mention it is unsupervised and uses unlabeled data. Examiners expect the distinction from classification (no predefined labels).
- **Dimensionality Reduction** is listed as a sub-category of unsupervised learning models but not elaborated in the passages — give a definition + purpose + example for full marks.
- The key examiner expectation: link both to **unsupervised learning** and **unlabeled data**.

Q19. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § Test Yourself (MCQs and Assertion-Reasoning) § Reflection Time [1]

Which form of unsupervised learning does the following diagram indicate ?

- (a) Clustering
- (b) Regression
- (c) Reinforcement learning
- (d) Classification

Previously asked in: 2024 104 Q4 (ii)

♦ Advanced Concepts of Modeling in AI

2.2 Modelling

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Model Answer

(a) Clustering

The diagram shows two groups of data points enclosed in separate ovals, representing data grouped by similarity without predefined labels — which is clustering, a form of unsupervised learning.

Explanation

Clustering is a subcategory of unsupervised learning where the model groups similar data points together based on patterns, without any predefined class labels. The diagram clearly shows two distinct clusters (ovals), making option (a) the correct answer. Regression predicts continuous values (supervised), classification uses labeled categories (supervised), and reinforcement learning uses rewards/penalties — none of which match the diagram.

Q20.

[1]

Which scenario best represents a regression problem ?

- (A) Identifying whether an email is spam.
- (B) Grouping customers by behaviour.
- (C) Predicting tomorrow's temperature.
- (D) Recognizing faces in photos.

Previously asked in: 2026 104 Q4 (iii)

♦ Advanced Concepts of Modeling in AI

2.2 Modelling

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Model Answer

(C) Predicting tomorrow's temperature.

Regression models predict a **continuous value** (e.g., temperature, price). Predicting tomorrow's temperature outputs a numerical value, making it a regression problem.

Source: Regression Model, chapter 2

Explanation

- **Why not (A)?** Spam/not-spam is a discrete (categorical) output → **Classification**.
- **Why not (B)?** Grouping customers by behaviour with no predefined labels → **Clustering** (Unsupervised).
- **Why not (D)?** Recognizing faces assigns a label/category → **Classification**.
- The textbook explicitly states: *"Temperature is a continuous variable... Regression models are well-suited for predicting continuous outputs."* Always link regression to **continuous numerical outputs**.

Q21. § 2.3 Artificial Neural Networks**[4]**

What are Neural networks ? Briefly explain all the layers of a neural network.

Previously asked in: 2024 104 Q17

♦ Advanced Concepts of Modeling in AI

2.3 Artificial Neural Networks

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Model Answer**Neural Networks:**

Neural networks are loosely modelled after how neurons in the human brain behave. They can extract data features automatically without needing input from the programmer. A neural network is a system of organising machine learning algorithms to perform certain tasks. It is fast and efficient for solving problems with very large datasets, such as images.

Layers of a Neural Network:

1. **Input Layer:** The first layer. It acquires data and feeds it to the network. No processing occurs here.
1. **Hidden Layer(s):** These layers perform all the processing using weights and biases on each node. Each node runs its own machine learning algorithm on the received data. There can be multiple hidden layers depending on the complexity of the task.
1. **Output Layer:** The last layer. It receives the final processed data from the hidden layers and presents it to the user. Like the input layer, no processing occurs here.

Source: Chapter 2, Section 2.3 – Artificial Neural Networks

Explanation

- The question is worth 4 marks, so examiners expect: a brief definition (1 mark) + explanation of all three layers with their roles (3 marks — 1 each).
- Key phrase to remember: "**no processing at input/output layer**" — this is a commonly tested point.
- Mention **weights and biases** for the hidden layer to show accurate understanding.
- Do not confuse "multiple hidden layers" with separate marks — mention it as a feature of the hidden layer briefly.

Q22. § 2.2 Modelling § Test Yourself (MCQs and Assertion-Reasoning) § Reflection Time

[2]

Give any two characteristics of a Classification Model.

Previously asked in: 2026 104 Q12

♦ Advanced Concepts of Modeling in AI 2.2 Modelling

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Model Answer

Two characteristics of a Classification Model are:

1. **Works on discrete/categorical data** — The output is a category or class label (e.g., "spam" or "not spam", "hot" or "cold"). The predicted values are not continuous.
1. **Uses labeled data for training** — It is a type of supervised learning where the training dataset contains predefined class labels to which new data points are assigned.

Source: Chapter 2, Classification Model (Sub-categories of Supervised Learning)

Explanation

Examiners expect students to clearly name each characteristic and briefly explain it. The two most important points from the textbook are: (i) classification works on **discrete** (not continuous) data, and (ii) it assigns data to **predefined class labels** using labeled training data. Avoid confusing classification with regression (which predicts continuous values) or clustering (which has no predefined labels).

Q23. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § Test Yourself (MCQs and Assertion-Reasoning) § Reflection Time **[4]**

Consider the following graphs (Figure 1 and Figure 2) that demonstrate the two types of Supervised Learning Models of Artificial Intelligence. Identify and explain each model giving suitable examples of each.

Previously asked in: 2024 104 Q20

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

2.2 Modelling

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Model Answer

The two graphs represent the two sub-types of **Supervised Learning** models: **Classification** and **Regression**.

Figure 1 – Classification Model:

In this model, data is classified into discrete categories/labels. The straight dashed line acts as a decision boundary separating two groups. It works on discrete (non-continuous) data.

Example: Classifying emails as "spam" or "not spam" based on labeled training data.

Figure 2 – Regression Model:

In this model, a continuous curved/straight line is fitted through the data points to predict continuous output values. It works on continuous data.

Example: Predicting the price of a house based on features like number of bedrooms, carpet size, and garage area.

Both models learn from **labeled data**, which is the defining feature of Supervised Learning.

Source: Chapter 2, Section 2.2 – Sub-categories of Supervised Learning Model

Explanation

- The question asks you to **identify** (name) and **explain** each model with examples — so you must do all three parts for each figure.
- Figure 1 shows a linear decision boundary → Classification (discrete output).
- Figure 2 shows a curve fitted to points → Regression (continuous output).
- Key distinguisher: **discrete output = Classification; continuous output = Regression.**
- Always mention that both fall under Supervised Learning (labeled data) — examiners often award a mark for this link.

Q24. § Unit-2: Advanced Concepts of Modeling in AI – Introduction § 2.2 Modelling § Reflection Time

[4]

Consider the following diagram. It explains how a system of organized machine learning algorithms perform certain tasks. Identify the concept and explain its working.

Previously asked in: 2024 104 Q19

♦ Advanced Concepts of Modeling in AI

2.3 Artificial Neural Networks

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Model Answer

Concept: Neural Network (Deep Learning)

The diagram illustrates a **Neural Network**, a Deep Learning model inspired by the human brain's structure.

Working:

- A neural network consists of interconnected nodes (neurons) organized in three layers:
 1. **Input Layer** – Receives raw data (e.g., pixel values of an image).
 2. **Hidden Layer(s)** – Multiple ML algorithms work together to automatically extract features and identify patterns from the data.
 3. **Output Layer** – Produces the final result (e.g., identifying the object as a bird).
- Each node acts as a machine learning algorithm, processing information passed from the previous layer.
- The network is trained on large datasets, enabling it to develop its own algorithms and improve accuracy over time without explicit programming.

Source: Chapter 2, Section 2.1 & Sub-Categories of Deep Learning

Explanation

- The diagram showing "organized machine learning algorithms performing tasks" points to **Deep Learning / Artificial Neural Network (ANN)** — multiple ML algorithms working together in layers.
- Examiners expect: name of concept, inspiration (human brain), three layers with their roles, and the key feature (automatic feature extraction from large data).
- Don't confuse ANN with simple ML — emphasize *multiple* algorithms and *layers* as the distinguishing features.
- 4 marks = concept identification (1) + three layers explained (2) + key characteristic (1).

Q25. § 2.2 Modelling § Test Yourself (MCQs and Assertion-Reasoning)**[1]**

Regression is one of the type of supervised learning model, where data is classified according to labels and data need not to be continuous. (True / False)

Previously asked in: 2023 104 Q2 (v)

♦ Advanced Concepts of Modeling in AI

2.2 Modelling

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Model Answer**False.**

Regression is a type of supervised learning, but it works on **continuous data** (e.g., predicting salary or house price). It is the **Classification** model where data is classified according to labels and data need not be continuous.

Explanation

The statement mixes up two sub-types of Supervised Learning. The textbook clearly states: *Classification* — data is classified according to labels, works on discrete (non-continuous) data; *Regression* — works on continuous data to predict a value. The statement incorrectly attributes classification's features to regression, making it **False**.

Q26. § 2.3 Artificial Neural Networks § Test Yourself (MCQs and Assertion-Reasoning) § Reflection Time**[1]**

Which of the following is the correct feature of Neural network?

- (a) It can improve the efficiency of two models.
- (b) It is useful with small dataset.
- (c) They are modelled on human brains and nervous system.
- (d) They need human intervention.

Previously asked in: 2023 104 Q4 (iii)

♦ Advanced Concepts of Modeling in AI

2.3 Artificial Neural Networks

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Model Answer**(c) They are modelled on human brains and nervous system.****Explanation**

The passage states: "*Neural networks are loosely modelled after how neurons in the human brain behave.*" Options (a), (b), and (d) are incorrect — neural networks work best with **large** datasets and extract features **without** human intervention.

Q27. § Unit-2: Advanced Concepts of Modeling in AI – Introduction**[1]**

The following diagram indicates :

- (A) Classification
- (B) Regression
- (C) Reinforcement learning
- (D) Clustering

Previously asked in: 2025 104/S Q4 (ii)

♦ Advanced Concepts of Modeling in AI

2.1 Revisiting AI, ML, DL

2.2 Modelling

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Clustering is an unsupervised learning technique where data points are grouped based on similarity without predefined labels. The diagram showing ungrouped data points being divided into distinct groups represents clustering.

Q28. § Reflection Time**[1]**

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

Previously asked in: 2026 104 Q3 (iii)

♦ Advanced Concepts of Modeling in AI

Collaborative Filtering / Recommendation Systems

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(C) Association model — This recommendation ("customers who bought X also bought Y") identifies relationships/associations between products purchased together, which is exactly what an Association model does.

Explanation

The Association model (a sub-category of Unsupervised Learning) finds interesting relationships between variables in a database — e.g., bread buyers also buy butter. The textbook explicitly states such associations are used to recommend items to customers. Classification predicts categories, Regression predicts continuous values, and Clustering groups similar data points — none of these match "co-purchase" pattern finding.

Q29. § 5.6 Convolution Neural Networks (CNN)**[4]**

Answer the following:

(A) Expand and define the terms CNN and ANN. [3]**(B)** In the diagram of neural network given below, identify the layer that should be depicted in Box 1 and Box 2: [1]

Previously asked in: 2026 104 Q20

♦ Computer Vision

2.3 Artificial Neural Networks

5.6 Convolution Neural Networks (CNN)

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Model Answer**(A) CNN and ANN:**

CNN – Convolutional Neural Network: CNN is a Deep Learning algorithm that takes an input image, assigns importance (learnable weights and biases) to various aspects/objects in the image, and differentiates one from the other. It consists of layers: Convolution Layer, ReLU, Pooling Layer, and Fully Connected Layer.

ANN – Artificial Neural Network: ANN is a computational model inspired by the human brain, consisting of interconnected nodes (neurons) organised in layers that process information to learn patterns and make decisions.

(B) Identification of Layers:

- **Box 1 → Hidden Layer** (the intermediate processing layer between input and output)
- **Box 2 → Output Layer** (produces the final prediction/result)

Source: Chapter 5, Section 5.6 Convolutional Neural Networks (CNN)

Explanation

- For **(A)**, the examiner expects the full form + a clear definition for each term. CNN's definition is directly from the textbook (Section 5.6); ANN is a prerequisite concept — keep it concise but accurate.
- For **(B)**, in a standard feedforward neural network diagram, the layers in order are: **Input Layer → Hidden Layer(s) → Output Layer**. Since Box 1 and Box 2 are the unlabelled middle and last layers respectively, they correspond to Hidden Layer and Output Layer. Always name them precisely — partial credit may be lost for vague answers.
- Do **not** expand on CNN layers in sub-question (A) beyond what is necessary; save word count as this is only 3 marks.

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