Past-paper walk-through

Artificial intelligence ▪ 6.3

eXercise

Questions in this set

- 0478/12 N25 Q7 ▪ 16 marks
- 0478/13 N25 Q6 ▪ 12 marks
- 0478/12 M25 Q6 ▪ 6 marks
- 0478/11 N24 Q9 ▪ 8 marks
- 0478/12 N23 Q10 ▪ 7 marks
- 0478/12 J23 Q9 ▪ 5 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 7

0478/12 N25 ▪ Q7 ▪ 16 marks

A house has a smart speaker that can take voice commands as input. A person in the house can tell the smart speaker to play music or audio books.

(a) The smart speaker cannot be described as a robot.

Explain why the smart speaker is not a robot. **[3]**

Question 7

0478/12 N25 ▪ Q7 ▪ 16 marks

A house has a smart speaker that can take voice commands as input. A person in the house can tell the smart speaker to play music or audio books.

(b) Identify the input device that allows voice commands to be used as input. **[1]**

Question 7

0478/12 N25 ▪ Q7 ▪ 16 marks

A house has a smart speaker that can take voice commands as input. A person in the house can tell the smart speaker to play music or audio books.

(c) The smart speaker has machine learning capabilities.

Explain how the smart speaker can use machine learning to improve the voice command input. **[4]**

Question 7

0478/12 N25 ▪ Q7 ▪ 16 marks

A house has a smart speaker that can take voice commands as input. A person in the house can tell the smart speaker to play music or audio books.

(d) The smart speaker is an example of an embedded system.

Explain why the smart speaker is an embedded system. **[2]**

Question 7

0478/12 N25 ▪ Q7 ▪ 16 marks

A house has a smart speaker that can take voice commands as input. A person in the house can tell the smart speaker to play music or audio books.

(e) The music and audio books that are played by the smart speaker are stored in cloud storage.

Give **two** advantages of storing the music and audio books in cloud storage.

1. 2. **[2]**

Question 7

0478/12 N25 ▪ Q7 ▪ 16 marks

A house has a smart speaker that can take voice commands as input. A person in the house can tell the smart speaker to play music or audio books.

(f)(i) Explain how errors may occur in the data during transmission. **[2]**

(f)(ii) Give **two** error detection methods that could be used to check for errors in the data after transmission.

1. 2. **[2]**

Solution 7

(a)

Mark scheme

- It does not have a mechanical structure
- It does not have any actuators
- ... so it cannot move itself

Solution 7

(b)

Mark scheme

- Microphone

Solution 7

(c) Mark scheme

- Any four from:
- For example:
- ▪ Gather data from the same/different voices // It can ask a user to say lots of different words
- ▪ Analyse/identify patterns in a user's voice
- ▪ It can adapt its own processes
- ▪ It can learn to identify a user's voice
- ▪ Stores successful/unsuccessful voice commands

Solution 7

- It can learn different ways of making the same request
- It can learn the different pronunciations // It can learn different accents
- It can learn by listening to lots of different voices
- It can learn to ignore any background/environmental noise if a user is speaking

Solution 7

(d)

Mark scheme

- Any two from:
- ▪ It has a single/limited function
- ▪ It has dedicated hardware
- ▪ It has a microprocessor
- ▪ Its function is not easily changed

Solution 7

(e) Mark scheme

- Any two from:
- For example:
- ▪ The music/books can be easily accessed from any smart speaker
- ▪ The user doesn't need to purchase a secondary storage device for the books/music // Smart speaker doesn't need a large amount of secondary storage
- ▪ The user doesn't need to maintain the storage needed for the books/music
- ▪ Smart speaker can be smaller in size (as it doesn't need large amounts of secondary storage)
- ▪ Almost unlimited storage available for the books/music // Easy to increase storage capacity needed

Solution 7

(f)(i) Mark scheme

- Any two from:
- ▪ Data could be lost
- ▪ Data could be gained
- ▪ Data could be changed
- ▪ Skewing of data could occur
- ▪ Interference could occur
- ▪ Crosstalk could occur
- ▪ Data collisions could occur

Solution 7

- Data packets could time out/reach their hop count

Solution 7

(f)(ii)

Mark scheme

- Any two from:
- ▪ Parity byte check
- ▪ Parity block check
- ▪ Checksum
- ▪ Echo check
- ▪ ARQ

Question 6

0478/13 N25 ▪ Q6 ▪ 12 marks

A computer game is programmed to use artificial intelligence (AI) to create the movements and actions of the computer-controlled characters in the game.

(a) Describe what is meant by AI. **[3]**

(b) Explain how the AI can be used to improve the movements and actions of the computer-controlled characters. **[3]**

(c) The computer game is programmed using a high-level language.

Explain **one** difference between a high-level language and a low-level language. **[2]**

(d)(i) Translates and executes the source code one line at a time. **[1]**

(d)(ii) Translates the source code and will not execute it if errors are found. It instead produces a full report of the errors in the source code. **[1]**

(d)(iii) Translates the source code and produces an executable file. **[1]**

Question 6

(d)(iv) Stops execution of the machine code where an error is found and will resume execution of the machine code once the error is fixed. **[1]**

Solution 6

(a)

Mark scheme

- Any three from:
- ▪ Simulation of intelligent behaviours by computers
- ▪ Collection of data and rules for using that data
- ▪ A computer that has the ability to learn
- ▪ A computer that has the ability to adapt
- ▪ A computer that has the ability to reason/make decisions

Solution 6

(b) Mark scheme

- Any three from
- For example:
- ▪ It could use machine learning
- ▪ It can collect data about the players actions
- ▪ Analyse/identify patterns in the player's movements
- ▪ ... so it can learn how the player moves
- ▪ ... to help predict the next movement of the player

Solution 6

- ▪ It can adapt its own movements to match the players // It can adapt its own processes
- ▪ It can store successful/unsuccessful moves
- ▪ It will learn the most efficient/optimal movements against a player

Solution 6

(c) Mark scheme

- Two from (one mark for high-level, one mark for matching comparison to low-level)
- ▪ High-level language is written in English-like statements ...
- ▪ ...low-level language is written using mnemonics/as machine code/in binary
- ▪ High-level language is easier to read/write/debug ...
- ▪ ... low-level language is more difficult to read/write/debug
- ▪ High-level language is machine independent/portable ...
- ▪ ...low-level language is not machine independent/portable

Solution 6

- High-level language cannot directly manipulate the hardware ...
- ... low-level language can directly manipulate the hardware
- In high-level language, one line of code can perform multiple actions ...
- ... in low-level language, one line of code performs a single action

Solution 6

(d)(i)

Mark scheme

- Interpreter

(d)(ii)

Mark scheme

- Compiler

(d)(iii)

Mark scheme

- Compiler

Solution 6

(d)(iv)

Mark scheme

- Interpreter

Question 6

0478/12 M25 ▪ Q6 ▪ 6 marks

A search engine uses artificial intelligence (AI) to identify the most relevant web pages for the user.

(a) One characteristic of AI is the ability to learn.

Identify **three** other characteristics of AI.

1. 2. 3. **[3]**

(b) The search engine uses machine learning.

Explain how machine learning is used by the search engine. **[3]**

Solution 6

(a)

Mark scheme

- Any three from:
- ▪ Collection of data
- ▪ Rules for data
- ▪ Ability to reason
- ▪ Ability to adapt

Solution 6

(b) Mark scheme

- Any three from:
- Examples
- ▪ Changes its data/rules
- ▪ ... according to feedback/results
- ▪ If a result does not give a suitable response this is recorded
- ▪ ... next time the result is changed
- ▪ ... to provide more accurate/relevant results in future
- ▪ Supervised/unsupervised learning

Question 9

0478/11 N24 ▪ Q9 ▪ 8 marks

A doctor's surgery has an expert system that helps diagnose the illnesses of its patients.

(a) Complete the paragraph about the operation of the expert system.

Use the terms from the list.

Some of the terms in the list will **not** be used. Some terms may be used more than once.

- artificial
- binary
- central processing unit (CPU)
- data
- inference engine
- interface

Question 9

- knowledge base
- primary storage
- process
- real
- read only memory (ROM)
- rule base

An expert system is a type of ___ intelligence. The doctor will type data about the symptoms of the illness into the ___.
The ___ will decide which questions to ask the doctor. It will do this by linking the facts in the ___ to the ___.
The ___ will decide on a diagnosis and this will be output on the ___. **[7]**

Question 9

0478/11 N24 ▪ Q9 ▪ 8 marks

A doctor's surgery has an expert system that helps diagnose the illnesses of its patients.

(b) The expert system has the ability to automatically adapt its own processes and data.

Give the name of this ability. **[1]**

Solution 9

(a) Mark scheme

- One mark for each correct term in the correct order.
- ▪ artificial
- ▪ interface
- ▪ inference engine
- ▪ knowledge base
- ▪ rule base
- ▪ inference engine
- ▪ interface

Solution 9

(b)

Mark scheme

- Machine learning

Question 10

0478/12 N23 ▪ Q10 ▪ 7 marks

10 A business has a system that is described as having artificial intelligence (AI).

(a) State **one** of the main characteristics of an AI system.

Question 10

(b) An AI system is an expert system.

Explain how an expert system operates.

Solution 10

(a) Mark scheme

- Any one from:
- –
- The ability to learn/adapt // machine learning abilities
- –
- The collection of data and the rules for using that data
- –
- The ability to reason // has problem solving abilities // makes predictions
- –

Solution 10

- Simulates intelligent/human behaviour
- —
- Analyses patterns
- 1

Solution 10

(b) Mark scheme

- Any six from:
- —
- It has an interface ...
- —
- ... used to input data/view output
- —
- It has a knowledge base
- —

Solution 10

- It has a rule base
- –
- It has an inference engine
- –
- Applies the rule base to/and the knowledge base to provide
- output/diagnosis/result/solution/decision
- –
- Decides what to ask next based on the data input
- 6
- 0478/12

Solution 10

- October/November
- 2023

Question 9

0478/12 J23 ▪ Q9 ▪ 5 marks

9 One component of an expert system is the inference engine.

(a) Identify the **three** other components in an expert system.

Question 9

[3]

(b) Describe the role of the inference engine in an expert system.

Solution 9

(a) Mark scheme

- Three from:
- ▪
- Rule base
- ▪
- Knowledge base
- ▪
- Interface
- 3

Solution 9

(b) Mark scheme

- Any two from:
- ▪
- It makes decisions
- ▪
- ... by applying the rules/logic to the facts/knowledge ...
- ▪
- ... to provide a result/diagnosis
- 2