CAMBRIDGE
International Education

Cambridge IGCSE™

COMPUTER SCIENCE **0478/12**

Paper 1 Theory **May/June 2024**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mark scheme abbreviations

/ separates alternative words/phrases within a marking point
// separates alternative answers within a marking point
underline actual word given must be used by candidate (grammatical variants accepted)
bold means that some notion of that term needs to be present
max indicates the maximum number of marks that can be awarded
( ) the word/phrase in brackets is not required, but sets the context

Note: No marks are awarded for using brand names of software packages or hardware.

Question	Answer	Marks
1(a)	(1) byte	**1**
1(b)	8192	**1**
1(c)	(1) Tebibyte // TiB	**1**
1(d)	**One** mark for each correct stage of working (**max** 2): • 512 × 512 • 262 144 * 2 // multiplied by 16 and divided by 8 • 524 288/1024 **One** mark for the correct answer: 512 (KiB)	**3**

Question	Answer	Marks
2(a)	**D**	**1**
2(b)	Packet	**1**
2(c)(i)	Data is **encrypted** and **decrypted** using the **same** key (1 mark) Any **three** from: • Plain text is encrypted into cipher text // cipher text is decrypted into plain text • **Data** is encrypted using an **algorithm** … • … that uses a key • The **key** can be generated using an **algorithm** • The **key** is **transmitted** to the receiver	**4**
2(c)(ii)	Any **one** from: • To help keep the data secure • To make the data meaningless	**1**

Question	Answer	Marks
3(a)	Hexadecimal	**1**
3(b)(i)	1010 110010 11001001	**3**
3(b)(ii)	**Two** from: • Computers use **logic gates/switches** … • … that only process the values 1 and 0 // that only have two states	**2**
3(c)	**One** mark for evidence of working, for example 2 carries **One** mark for each correct nibble (Max 2) 1 1 0 0 1 1 0 0 0 0 0 1 1 0 0 1 1 0 1 0 0 1 0 1 1 0	**3**
3(d)	**One** marking for evidence of working For example, flip and add **One** mark for correct binary 11100000	**2**
4(a)	Any **one** from: • Operating system • Utility software // by example	**1**

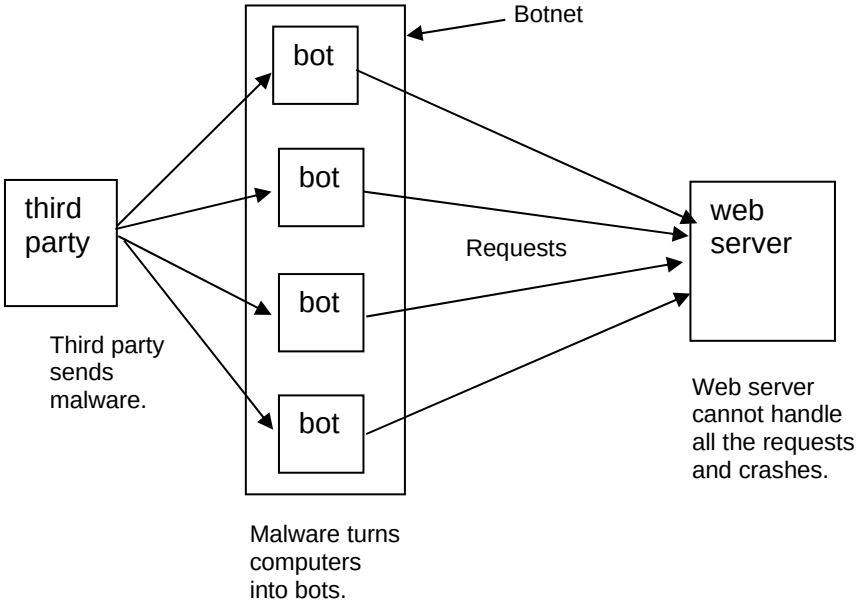
Question	Answer	Marks
4(b)	Any **two** from.: Example: • Word processor • Spreadsheet • Database • Web browser • Image/photo-editor • Video-editor • Email client • Game • Social media app	**2**
4(c)	Any **two** from: • System software **manages/maintains** the **hardware/software** • Applications software allows the **user** to perform tasks	**2**

Question	Answer	Marks
5(a)	**One** mark for each correct term in the correct place: • address • memory address register // MAR • random access memory // RAM • memory data register // MDR • data • current instruction register // CIR • control unit // CU	**7**
5(b)	A **list** of (machine code) **commands** that can be processed by the CPU	**1**

Question	Answer	Marks
6	**One** mark for each correct method.	**5**

error detection method	statement
parity (check/bit/byte/block)	An odd or even process can be used.
checksum	A value is calculated from the data using an algorithm. This happens before and after the data is transmitted.
echo check	A copy of the data is sent back to the sender by the receiver.
automatic repeat query/request // ARQ	Acknowledgement and timeout are used.
check digit	A value is appended to data that has been calculated using the data. This value is checked on data entry.

Question	Answer	Marks
7(a)	**A**	**1**
7(b)(i)	An IP address that has numerical values separated by dots that follows the format with a max value of 255 in any xxx xxx.xxx.xxx.xxx Example: 10.245.3.99	**1**
7(b)(ii)	Any **two** from: • 128-bit // 16 bytes • Hexadecimal • Separated by colons • Characters in groups of 4 • Has 8 groups of characters • Double colons can be used for sets of (consecutive) zeros (only once)	**2**

Question	Answer	Marks
8(a)	**One** mark for each part of the diagram that shows: • A perpetrator/third party sending malware // user downloads/installs malware • Each computer is turned into a bot… • … to create a botnet • Third party initiates the attack • **All** the bots send a request at once to a **web server** • … crashing the webserver Example:  	**5**
8(b)	Proxy server	**1**

Question	Answer	Marks
9(a)	Any **two** from: • To store data/files **permanently** • … otherwise, data/programs would need to be downloaded/entered/installed every time the computer was used • To allow **software** to be **installed** on the computer • For the creation of <u>virtual memory</u>	**2**
9(b)	Any **six** from (**Max 3** for one type only): • Solid-state has no moving parts • … optical does have moving parts • Solid-state is faster to **access** data • … optical is slower to **access** data • Solid-state uses less power to operate • … optical uses more power to operate • Solid-state runs quietly • … optical makes more noise • Solid state is more durable/robust • … optical is less durable/robust • Solid state storage has a large storage capacity • … optical has a much smaller limit to its storage capacity • Solid-state is more expensive **per GB** of data • … optical is cheaper **per GB** of data • Solid-state stores data onto silicon chips/transistors using logic (floating/control/NAND/NOR) gates to control the movement of electrons • … optical stores data by using lasers to burning pits and lands onto a disk	**6**

Question	Answer	Marks
10(a)	Any **two** from: • The **simulation** of intelligent behaviours by computers • A collection of data and the rules for using that data • Has the ability to reason • Has the ability to learn/adapt	**2**
10(b)	Any **five** from: • The user will enter data into the **interface** // The user will plug the car into an **interface** // The user is given questions using the **interface** • The **inference engine** will decide which questions to ask • … by using the previous answers given • The **inference engine** will decide on a diagnosis • … by **comparing the data/answers** entered to the **knowledge base** and **rule base** • … by calculating which option is most likely if there are multiple • The **interface** will output the **diagnosis**/**result** • The **explanation system** shows **how** the diagnosis was reached	**5**

Question	Answer	Marks
11(a)	Any **two** from: • The internet is the infrastructure • The world wide web is a collection of web pages	**2**
11(b)	Protocol Domain name File **name** // web page **name**	**3**
11(c)	Any **three** from: Example: • Displays a web page • Storing bookmarks/favourites • Recording user history • Allowing use of multiple tabs • Storing cookies • Providing navigation tools • Can set a home page	**3**