CAMBRIDGE
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COMPUTER SCIENCE **0478/12**

Paper 1 Computer Systems **February/March 2025**

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 February/March 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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)
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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

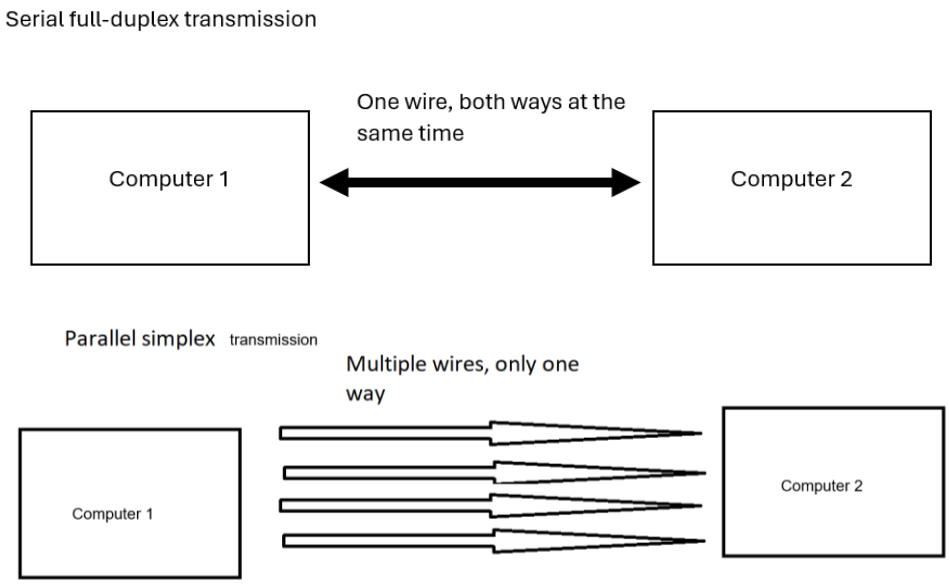
The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	Correct point
	Incorrect point
	Unclear response
FT	Follow through
REP	Repetition
I	Ignore
BOD	Benefit of doubt given
TV	Content of response too vague
NAQ	Not answered question
	Omission
	Section not relevant
	Section incorrect
Highlighter	Information copied from the text
SEEN	Page or response seen by examiner

Question	Answer	Marks
1(a)	1 mark for each correct item (in bold) The binary number system is base **2**. The smallest denary number that can be represented an 8-bit binary number is **0**. The largest denary number that can be represented an 8-bit binary number is **255**. The hexadecimal number system is base **16**. Each hexadecimal digit is equivalent to **4** bits. The numbers 1 to 9 are used and the number 10 is represented by **A**. The hexadecimal number system continues up to the number 15, which is represented by **F**.	**7**
1(b)	1 mark for correct working, 1 mark for each correct nibble For example: 1 0 0 1 1 0 1 1 + 0 0 0 1 0 0 1 1 1 0 1 0 1 1 1 0 1 1 1	**3**
1(c)	C	**1**

Question	Answer	Marks
2(a)	Any one from: • Number of bits used to represent each/a/one colour • Number of colours that **can** be represented	**1**
2(b)	Any two from: • The higher the resolution the more pixels • The higher the resolution the more bits to store • The higher the resolution the larger the **file** size	**2**
2(c)(i)	Any three from: Examples: • Lossless will retain all parts of the image // lossless does not delete any data // The artist does not want any of the image to be lost when downloaded • Lossy will reduce the **quality** • … because the **artist** wants to provide the detailed image • Image may be small in file size anyway • … server has enough space to store the image • … download time is not excessive	**3**
2(c)(ii)	1 mark for naming, max 2 for describing, for example: • Run-length encoding • **Repeating** pixels of one colour are identified // <u>patterns</u> are identified • … and indexed // put into a table // assigned a value • … as the number of repetitions and the colour code	**3**

Question	Answer	Marks
2(d)(i)	Max 5 overall Any three from: • Data is split into **fixed size** packets • The data is the payload • Each packet is given a header • … example of header data e.g. Destination **IP**, packet number, hop number • Each packet has a trailer • … example of trailer data e.g. error checking method Any three from: • Router directs each packet towards its **destination** • Routes selects the **most efficient** path • Each packet can take a **different** path • Packets can arrive out of order • … after the last packet has arrived, they are reordered	**5**
2(d)(ii)	The completed diagram showing: • Parallel simplex having multiple wires and serial having one wire • Serial full-duplex going both ways **at the same time** • Parallel simplex only going one way For example: 	**3**

Question	Answer	Marks
3(a)	Any one from: • Accumulator • Current instruction register • Program counter	**3**

Question	Answer	Marks
3(b)	Any one from: • Perform FDE cycle • Execute/process instructions	**1**
3(c)(i)	1 mark for Computer A Any two for justification: • It has **4** cores/processors • …**each core** will execute one instruction **at a time** • **4** instructions can be executed **simultaneously** (others can only execute 1 or 2)	**3**
3(c)(ii)	Any two from: • C has a higher clock speed // B has max 5 GHz • C can run **5.2 billion instructions**/FDE cycles **per second** • B can only run **5 billion instructions**/FDE cycles **per second** • Single core has less latency	**2**
3(d)	a **list of** the (machine code) commands that can be processed by a CPU	**1**

Question	Answer	Marks
4(a)(i)	Infra-red/proximity	**1**
4(a)(ii)	Any three from: • Receive **digital** data **continually** from the sensor • Uses sensor data to calculate distance to person • Compares calculated/sensor data to stored data/1m • … if **data/comparison** indicates person is within 1m, it sends signal to display welcome message on screen	**3**
4(b)	Any two from: • Dedicated function // special purpose device // not general purpose device • **Dedicated** hardware // by description, for example hardware is only used for ATM functions • Cannot be (easily) reprogrammed • Uses firmware • Contains microprocessor // does not have CPU	**2**
4(c)	1 mark for input, for example: • Microphone • Braille keyboard/pad 1 mark for output, for example: • Speaker	**2**

Question	Answer	Marks
5(a)(i)	Any two from: • **Transmit**/**send** data to the network/devices // **Receive** data from the network/devices • To allow a **physical** connection • Convert network data so it can be understood by the computer • Convert computer data to be transmitted over the network • To be assigned an IP address	**2**
5(a)(ii)	Any three from: • (Represented) in hexadecimal • Numbers are separated by colons/hyphens • Six **groups** of digits • Sets of 2-digit/8-bit (hex) numbers // 48 bits // 12-digits • Contains manufacturer ID and unique device number • Static address // cannot be changed	**3**
5(b)(i)	C	**1**
5(b)(ii)	Router	**1**
5(c)(i)	A collection of web pages	**1**
5(c)(ii)	Any four from • Uses SSL/TLS • Encrypts data • … which stops the data being understood if intercepted • … using asymmetric encryption • … data is encrypted using the web server's public key • … data can only be decrypted by the web server's private key • Data transmitted to the server can only be decrypted by the server • Uses digital certificates	**4**
5(c)(iii)	• Domain name • Web page name // file name	**2**

Question	Answer	Marks
6(a)	Any three from: • Collection of data • Rules for data • Ability to reason • Ability to adapt	**3**
6(b)	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	**3**

Question	Answer	Marks
7(a)	• Language: assembly • Translator: assembler	**2**
7(b)	Any four from • Each statement is translated and executed before the next • **Translator stops** when an error is found • … can correct and continue from where error found // **real time** debugging when/where error found • ... does not need to retranslate all the code again • Can test sections of the code • Can test without all the program code being functional/accurate/complete	**4**
7(c)	Any three from: Example • Code editor • Run-time environment • Error diagnostics // by example • Auto-complete • Auto-correct • Prettyprint // syntax highlighting • Collapse/expand block • Auto-**documentation**	**3**

