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CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/12**

Paper 1 Theory Fundamentals **May/June 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 May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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[Turn over

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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.

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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
	Incorrect
	To indicate where a key word/phrase/code is missing.
	Not relevant or used to separate parts of an answer.
	Indicates a part of the answer that is incorrect.
Highlighter	To draw attention to a particular aspect or to indicate where parts of an answer have been combined.
	Too vague.
	Repetition
	No examples or not enough.
	Benefit of Doubt.
	Not Answered Question.
	Indicates that work or a page has been seen including blank answer spaces and blank pages.
	Follow through.
	Ignore

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>1 mark for each correct row

<table>
<tr><th>Incorrect statement number</th><th>Corrected statement</th></tr>
<tr><td>1</td><td>The Program Counter (PC) stores the address of the next instruction to be fetched from memory.</td></tr>
<tr><td>3</td><td>The Control Unit (CU) sends signals to other components on the control bus.</td></tr>
<tr><td>4</td><td>The Memory Data Register (MDR) holds data to be stored in the memory address in the MAR. // The Memory Data Register (MDR) holds data read from the memory address in the MAR</td></tr>
</table></td><td>3</td></tr>
<tr><td>1(b)</td><td>1 mark for name, 1 mark for corresponding role

e.g.
• Current Instruction Register // CIR
• To store the instruction to be decoded / executed next

• Status register // SR
• To contain bits that can be referenced individually to indicate a state or event

• Interrupt register
• To store details of any interrupts that have occurred</td><td>2</td></tr>
<tr><td>1(c)</td><td>1 mark each to max 4

• At the start / end of FE cycle the interrupt register is checked
• The priority of any interrupts waiting is checked
• if the priority of the interrupt is higher than the current process
• the contents of the registers are stored on the stack
• The relevant Interrupt Service Routine (ISR) / interrupt handler is called to process the interrupt
• When the ISR has finished, a further check is made for higher priority interrupts
• if no more interrupts of higher priority, the register contents are restored and the next FE cycle continues</td><td>4</td></tr>
</table>

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Question	Answer	Marks
2(a)	**1 mark** for: 0010 0010 1110 **1 mark** for: 22E	**2**
2(b)(i)	**1 mark** for: -30	**1**
2(b)(ii)	**1 mark** for smallest, **1 mark** for largest Smallest: 1000 0000 Largest: 0111 1111	**2**
2(c)	**1 mark** for application and **1 mark** for corresponding justification e.g. • an application that performs financial / banking calculations • because financial transactions use only two decimal places and must be accurate, no accumulating / rounding errors and it is difficult to represent decimal values exactly in normal binary. Or • electronic displays • because visual displays only need to show individual digits • because conversion between denary and BCD is straightforward Or • The storage of the date and time in the BIOS of a PC • because conversion between denary and BCD is more straightforward Or • Barcode systems • because conversion between denary and BCD can be accurately completed	**2**

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Question	Answer	Marks
3(a)	**1 mark** each to **max 4** e.g. • Uses image recognition // optical character recognition • to analyse a photograph/pixels to identify the location of characters within an image • in order to convert the pattern of pixels into individual characters • Uses natural language • to combine the characters into words • and compare the words to database to identify a match in the language of the writing • it may also predict what is missing / incomplete / from what has been read • then compare the words to a database of the user's chosen language to find a match and translate • Uses text-to-speech • to generate the audio waveforms corresponding to the words	**4**
3(b)	**1 mark** each to **max 2** e.g. • It can help people with visual impairment to identify which products to purchase • It can help people who cannot understand the language • It can help to overcome learning / reading difficulties	**2**
3(c)(i)	**1 mark** each to **max 3** • The program is usually sold for a fee • Users have no access to source code • It protects the intellectual rights of the programmer / developer • Users cannot legally alter or share the program • There are limitations on the use of the software e.g. number of times it can be installed • Support and maintenance is usually provided e.g. updates, bug fixes etc.	**3**
3(c)(ii)	**1 mark** each to **max 3** e.g. • The source code would be accessible therefore it could be changed • which might lead to the program outputting an incorrect response • so people could purchase the wrong item • which might have serious consequences // by example e.g. allergies	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>1 mark each:

• X = (R NOR S) XOR T
• Y = (T AND U) OR U</td><td>2</td></tr>
<tr><td>4(b)</td><td>1 mark for first four rows, 1 mark for second four rows

<table>
<tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td></td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td></td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr>
</table>
</td><td>2</td></tr>
</table>

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Question	Answer	Marks
5(a)	**1 mark** each to **max 2** • To remove the many-to-many relationship • between CHARACTER and ITEM tables • To allow each character to have many items // to allow each item to be purchased for many characters • by creating a linking table • between the characters and the items purchased for each one	**2**
5(b)	**1 mark** for the three single Primary Keys **1 mark** for the composite key USER(Username, Password, DateOfBirth) CHARACTER(CharacterName, CharacterID, Username, Level, Money) ITEM(ItemName, MinimumLevel, Cost) CHARACTER_ITEM(CharacterID, ItemName)	**2**
5(c)(i)	**1 mark** for method **1 mark** for matching explanation e.g. • Access rights • appropriate permissions for the table USER are needed to read or edit the data • A password for the database or the USER table • prevents users without the password from accessing the data • Encrypting the database • stops users without the decryption key from decoding / understanding the data • Views • users can be given a view to the database that does not include the data in the table USER	**4**
5(c)(ii)	**1 mark** each to **max 2** e.g. • Validation • Enforce referential integrity • Cascade update / delete • Ensuring the database is normalised	**2**

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Question	Answer	Marks
5(d)(i)	**1 mark** for each point • Select COUNT • FROM (using correct tables) and joining • WHERE (or AND) condition for correct username Example 1: SELECT COUNT(ItemName) FROM CHARACTER_ITEM INNER JOIN CHARACTER ON CHARACTER.CharacterID = CHARACTER_ITEM.CharacterID WHERE CHARACTER.Username = "KAT123"; Example 2: SELECT COUNT(ItemName) FROM CHARACTER_ITEM, CHARACTER WHERE CHARACTER.CharacterID = CHARACTER_ITEM.CharacterID AND CHARACTER.Username = "KAT123";	**3**
5(d)(ii)	**1 mark** for each point • UPDATE character • SET level and money • WHERE condition e.g. UPDATE CHARACTER SET Level = 3, Money = 10000.00 WHERE CharacterID = "0002";	**3**

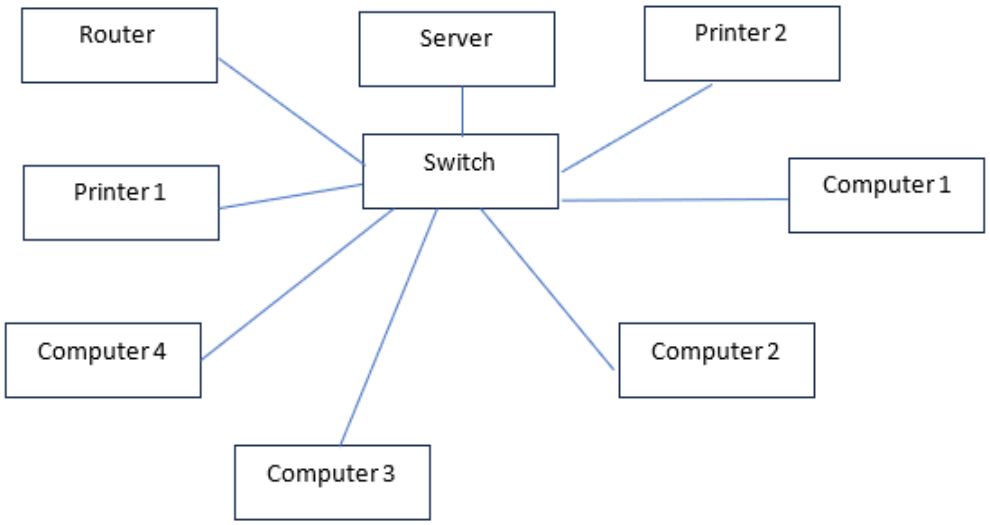
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Question	Answer	Marks
6(a)	**1 mark** each to **max 2** • In a WAN devices can connect over a larger geographical area in a LAN devices connect over a smaller geographical area • A WAN may use non-dedicated hardware the hardware in a LAN is usually dedicated • A WAN uses external / not company owned transmission media // the transmission media for a LAN is usually company owned	**2**
6(b)	**1 mark** each to **max 4** e.g. • Land is split into cells designed for maximum line of sight • Each cell has a tower with an antenna which receives and transmits data • Data is transmitted between the tower and the phone • Data transmission is wireless using low power radio signals/frequencies • Multiple devices can communicate simultaneously with the same tower	**4**
6(c)	**1 mark** for each correct word • **full stops** • **hexadecimal** • **zeros** • **128** • **dynamic** • **private** IPv4 is made of four groups of 8-bit numbers separated by **full stops**. Each IPv4 address is 32 bits. IPv6 is made of eight groups of 4 **hexadecimal** numbers separated by colons. Multiple consecutive groups of **zeros** can be replaced with a double colon. Each IPv6 address is **128** bits. A **dynamic** IP address can change each time the computer connects to a network. A **private** IP address can only be accessed by other devices in the same LAN and is assigned by the router within the LAN.	**6**

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Question	Answer	Marks
6(d)	**1 mark** each • Server directly connected to the switch • Four labelled computers all connected directly to the switch • Two printers each directly connected to the switch / server / a computer • Router / modem directly connected to the switch / server for internet access e.g. Example only  	**4**
6(e)	**1 mark** each to **max 3** e.g. • To store the MAC addresses of devices connected to it • To receive packets from devices • To forward packets directly to the intended recipient • To provide a central point of connection for the network • to enable connected devices to communicate	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(a)(i)</td><td>1 mark for each shaded section

<table>
<tr><td rowspan="2">Instruction address</td><td rowspan="2">ACC</td><td colspan="5">Memory address</td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr>
<tr><td></td><td></td><td>12</td><td>11</td><td>10</td><td>22</td><td>22</td></tr>
<tr><td>100</td><td>12</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>101</td><td>22</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>102</td><td></td><td></td><td>22</td><td></td><td></td><td></td></tr>
<tr><td>103</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>104</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>107</td><td></td><td>22</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td><td>3</td></tr>
<tr><td>7(a)(ii)</td><td>1 mark from:

• The number 10 will be loaded into the ACC instead of 12 / contents of address 10
• The addition will give 20 not 22 so the comparison will fail and result in an infinite loop</td><td>1</td></tr>
<tr><td>7(a)(iii)</td><td>1 mark for name of mode, 1 mark for matching description

e.g.
• Indirect
• The operand points to the memory location that contains the address of the data

• Indexed
• The address of the data is formed by adding the contents of the Index Register (IX) to the operand

• Relative
• The address is calculated using its distance from a base address</td><td>2</td></tr>
<tr><td>7(b)(i)</td><td>1 mark for:

1111 1111</td><td>1</td></tr>
<tr><td>7(b)(ii)</td><td>1 mark for:

0000 0011</td><td></td></tr>
</table>

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