Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/12**

Paper 1 Theory Fundamentals **October/November 2022**

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 October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

© UCLES 2022

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 descriptors 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.

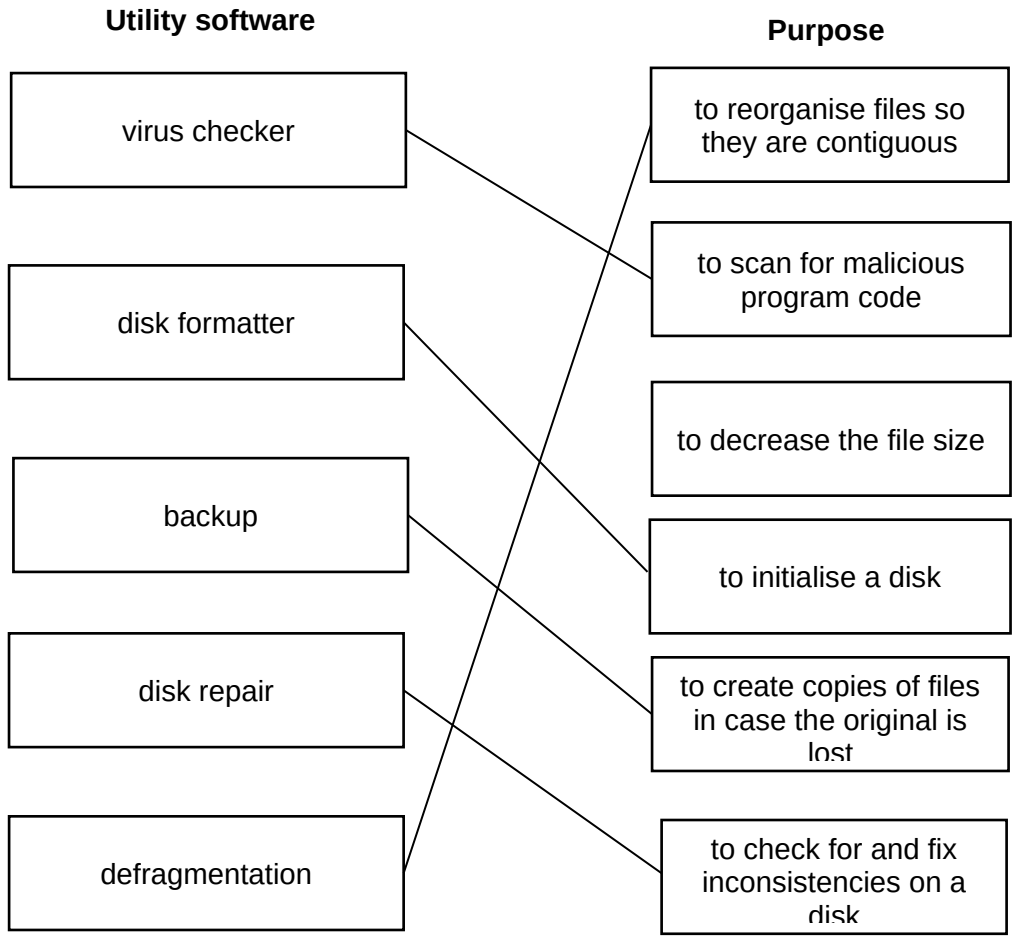
GENERIC MARKING PRINCIPLE 5:

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:

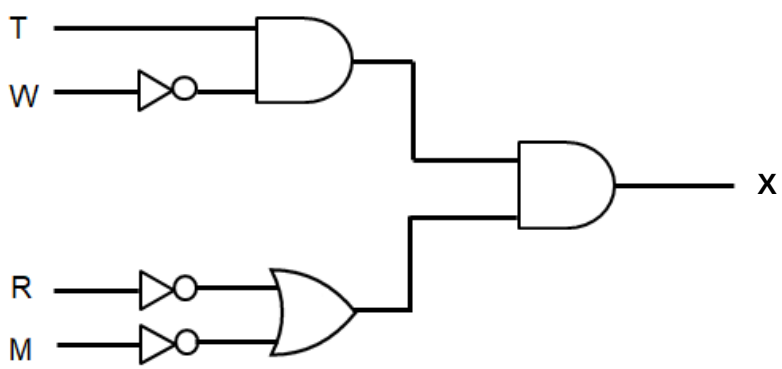
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

© UCLES 2022

Question	Answer	Marks
1(a)	**1 mark** for each correct line. 	**5**
1(b)(i)	**1 mark** for each bullet point **(max 2)**: • larger amounts of source code take time to compile • slower to produce the object code than an interpreter • code cannot be changed without recompilation • the program will not run if there are any errors • errors cannot be corrected in real-time • one error may result in other false errors being reported • cannot easily test specific sections of the source code // cannot easily test unfinished source code	**2**
1(b)(ii)	**1 mark** for each bullet point **(max 2)**: • partially compiled programs can be used on different platforms as they are interpreted when run • code is optimised for the CPU as machine code is generated at run time	**2**

Question	Answer	Marks
2(a)(i)	–106	**1**
2(a)(ii)	96	**1**

Question	Answer	Marks
2(a)(iii)	**1 mark** for each bullet point: • 149 decimal • 0001 0100 1001	**2**
2(b)	1101 0010	**1**

Question	Answer	Marks
3(a)	**1 mark** for T AND NOT W **1 mark** for NOT R OR NOT M **1 mark** for final AND 	**3**
3(b)	**1 mark** for each set of rows as highlighted: A B C X 0 0 0 1 0 0 1 0 0 1 0 0 0 1 1 0 1 0 0 0 1 0 1 0 1 1 0 0 1 1 1 0	**2**
3(c)	**1 mark** for each bullet point: • to **store** data that does not change • data must be **stored** even when device is without power • to **store** boot up instructions / system software / firmware / BIOS	**2**

Question	Answer	Marks
4(a)	data verification is checking if input data is the same as the original whereas data validation is checking that the data is reasonable / sensible	**1**
4(b)	**1 mark** for each bullet point **(max 3)**: • checksum value is calculated **from the data** before transmission // correct description of a checksum algorithm • ... this calculated value is transmitted with the data • **receiving** computer recalculates the checksum from the received data • if the checksum **received** and **calculated** match, no error has occurred // if the checksum **received** and **calculated** do not match, an error has occurred	**3**
4(c)	**1 mark** for each bullet point **(max 2)**. For example: • to make sure data is in the required format // only expected characters allowed • to make sure the data is already present in the system • to make sure the data contains the correct number of characters • to ensure that non-numeric data is entered	**2**

Question	Answer	Marks
5(a)	**1 mark** for each bullet point **(max 3)**: Solution 1: • removing the many-to-many relationship between Owner and Tree • ... by removing TreeID and TreePosition from the Owner table • ... and creating a linking table between Owner and Tree • ... that contains OwnerID, TreeID and TreePosition • ... (composite) primary key of the linking table should be OwnerID and TreeID // insert a named new primary key in the linking table Solution 2: • removing the many-to-many relationship between Owner and Tree • move TreePosition into TREE table • ... put OwnerID into TREE table • create a new table with suitable name (for the species of tree) • ... containing ScientificName, MaxHeight and FastGrowing • ... with ScientificName as primary key // or another suitable primary key	**3**

Question	Answer	Marks

5(b)	**1 mark** for each bullet point:
	
	• INSERT INTO TREE
	• VALUES ( ) and correct values
	• Values in correct order
	
	Option 1:
	`INSERT INTO`
	`TREE(TreeID, ScientificName, MaxHeight, FastGrowing)`
	`VALUES('LOW_1276', 'Salix_Alba', 30.00, TRUE);`
	
	Option 2:
	`INSERT INTO`
	`TREE`
	`VALUES('LOW_1276', 'Salix_Alba', 30.00, TRUE);`
		3

5(c)	**1 mark** for: An attribute / field (or set of attributes / fields) that **could** be a primary key	**1**
5(d)(i)	**1 mark** for description • stores metadata about the database **1 mark** for a correct example For example: • field / attribute names • table name • validation rules • data types • primary keys // foreign keys • relationships	**2**
5(d)(ii)	**1 mark** for each bullet point **(max 2)**: • the overview of a database structure • models the problem / situation • ... by using methods such as an ER diagram • independent of any particular DBMS	**2**

Question	Answer	Marks
6(a)(i)	**1 mark** for each method of ensuring authenticity **(max 2)**: • (email) message put through hashing algorithm to produce a digest • Digest encrypted with sender's private key (to create the digital signature) • the (digital) signature can **only** be decrypted with matching sender's public key	**2**

Question	Answer	Marks
6(a)(ii)	**1 mark** for each bullet point: • **monitors** incoming and outgoing packets / traffic • **checks against** an allow list / deny list of IP addresses // **checks against** a set of rules for acceptable data / ports etc. • **blocks** transmissions that do not meet criteria / rules // **allows** through is satisfies the criteria /rules	**3**
6(b)(i)	**1 mark** for each bullet point **(max 2)**: • **improves** the accuracy of the sound file • ... because (digital) waveform more closely resembles the **analogue wave**form • quantization errors are reduced • increases the amount of detail stored	**2**
6(b)(ii)	**1 mark** for each bullet point: • decreases the file size of the sound file • ... because fewer bits are used to store **each sample**	**2**

© UCLES 2022

Question	Answer	Marks
7(a)	**1 mark** for each set of highlighted rows.	**5**

Instruction address	ACC	IX	Memory address						
			100	101	102	103	110	111	112
			0	0	112	4	1	4	0
75		0							
76	1								
77									
78									
79									
80									
84	2								
85				2					
86	0								
87	1								
88			1						
89		1							
90									
76	4								
77									
78									
79									
80									
81	6								
82				6					
83									
86	1								
87	2								
88			2						
89		2							
90									

7(b)(i)	0100 1100	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(b)(ii)</td><td>0100 0001</td><td>1</td></tr>
<tr><td>7(b)(iii)</td><td>1001 1000</td><td>1</td></tr>
<tr><td>7(b)(iv)</td><td>1101 1111</td><td>1</td></tr>
<tr><td>7(c)</td><td>1 mark for each correct row:

<table><tr><th>Description</th><th>Register transfer notation</th></tr><tr><td>Copy the address of the next instruction into the Memory Address Register.</td><td>MAR ← [PC]</td></tr><tr><td>Increment the Program Counter.</td><td>PC ← [PC] + 1</td></tr><tr><td>Copy the contents of the Memory Data Register into the Current Instruction Register.</td><td>CIR ← [MDR]</td></tr></table></td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>1 mark one or two correct row(s). 2 marks for all three correct rows.

<table><tr><th>Action</th><th>Increases the file size</th><th>Decreases the file size</th><th>No change to the file size</th></tr><tr><td>Change the colour depth of the image file to 16 bits per pixel.</td><td></td><td>✓</td><td></td></tr><tr><td>Change the screen resolution to 1366 × 768 pixels.</td><td></td><td></td><td>✓</td></tr><tr><td>Change the colour of the rectangle from black to red.</td><td></td><td></td><td>✓</td></tr></table></td><td>2</td></tr>
<tr><td>8(b)</td><td>1 mark for each bullet point (max 2).
For example:
• can be enlarged without pixelation / loss of quality
• individual components of the image can be edited
• generally a smaller file size</td><td>2</td></tr>
<tr><td>8(c)(i)</td><td>1 mark for each correct underlined part:

<table><tr><th>Uncompressed sound</th><th>RLE compressed sound</th></tr><tr><td>EA F1 F1 F2 F2 F2 EA</td><td>1EA 2F1 3F2 1EA</td></tr><tr><td><u>AB AB FF FF 1D 67</u></td><td>2AB 2FF 11D 167</td></tr><tr><td>32 32 80 81 81</td><td><u>232 180 281</u></td></tr></table></td><td>2</td></tr>
</table>

Question	Answer	Marks
8(c)(ii)	**1 mark** for each bullet point: • all the data is required // no data can be lost • ... otherwise text file will be corrupted / not make sense	**2**

Question	Answer	Marks
9	**1 mark** for each bullet point **(max 2)**. For example: • incorrect recognition of faces leads to mistakes such as • ... access to facilities / systems may be denied • privacy issues / people do not like data being stored • individuals will feel safer • ... there might be a reduction in crime • faster boarding • catching criminals	**2**

Question	Answer	Marks
10(a)	all four computers directly connected to the **switch** and no other connections.	**1**
10(b)(i)	**1 mark** for the device. **1 mark** for corresponding reason. • Device: Server • Reason: Server processes the requests and authorises traffic // firewall software on the server authorises traffic // server acts as the proxy • Device: Switch • Reason: Switch is connected to all the computers // to share access to the router on the network	**2**
10(b)(ii)	**1 mark** for each bullet point **(max 3)**: • receive packets from devices / internet • find destination of packets using the IP address • forward packets to **the destination** • assign **private** IP addresses to devices on LAN • store/update/maintain a routing table • find most efficient **path** to destination • maintain table of MAC and IP addresses • provides the LAN with a public IP address • acts as a gateway • performs protocol conversion • acts as a firewall	**3**

© UCLES 2022