Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/12**

Paper 12 Theory Fundamentals **May/June 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 May/June 2022 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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[Turn over

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.

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Question	Answer	Marks
1(a)	**1 mark** for 1 correct line **2 marks** for 2 or 3 correct lines **3 marks** for all 4 correct lines **Term** → **Definition** Pixel → The smallest identifiable component of an image Bit depth → The number of bits used to represent each colour Image resolution → The number of pixels wide by the number of pixels high File header → Stores data about the image file, e.g. file format, number of bits per pixel, file size	**3**
1(b)(i)	8	**1**
1(b)(ii)	**1 mark** for working • **10** * **5** * **8** (bits) / **8** // = **50** (pixels) * **8** (bits) / **8** **1 mark** for answer • 50 (bytes)	**2**
1(c)	**1 mark** per point • Increasing the colour depth results in increased file size // Decreasing the colour depth results in smaller file size • Increasing the colour depth means more **bits per pixel** and hence more data stored // Decreasing the colour depth means fewer **bits per pixel** and hence less data stored	**2**
1(d)	**1 mark** per point • Use run-length encoding // RLE • Record the colour Blue, and the number of times it occurs 10	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>1 mark per point to max 2

• The lane detection system is built into / integrated into the car

• The lane detection system only performs one task
• The lane detection system is not easily changed/updated by the car owner</td><td>2</td></tr>
<tr><td>2(b)</td><td>1 mark for primary
• e.g. Miles travelled in the current journey, before the engine is turned off

1 mark for secondary
• e.g. Total miles travelled since the car was built // miles for most recent journey after engine switched off</td><td>2</td></tr>
<tr><td>2(c)</td><td>1 mark for all correct ticks

<table>
<tr><th>Statement</th><th>True</th><th>False</th></tr>
<tr><td>The screen always has five different layers</td><td></td><td>✓</td></tr>
<tr><td>A processor determines the horizontal and vertical coordinates of the point of contact</td><td>✓</td><td></td></tr>
<tr><td>The touchscreen will work if any object touches the screen</td><td>✓</td><td></td></tr>
</table>
</td><td>1</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>1 mark for correct opcode and 1 mark for corresponding operand

OR #255 // OR #154 // XOR #154

e.g.
• OR...
• ... #255</td><td>2</td></tr>
<tr><td>3(b)</td><td>1 mark for correct opcode and 1 mark for corresponding operand

XOR #255

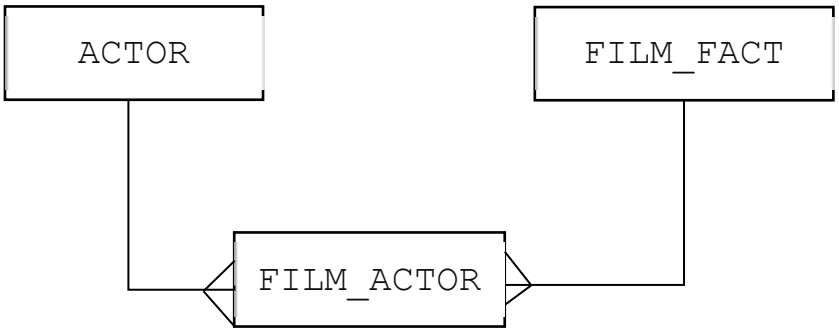
e.g.
• XOR...
• ... #255</td><td>2</td></tr>
<tr><td>3(c)</td><td>7E</td><td>1</td></tr>
<tr><td>3(d)</td><td>11110000</td><td>1</td></tr>
</table>

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Question	Answer	Marks
3(e)	**1 mark** per point • Correct conversion to binary 01111111 (127) and 00001100 (12) • Working e.g. turning 01111111 into two's complement 10000001 • Answer: 1000 1101	**3**

Question	Answer	Marks
4(a)	**1 mark** per point, **max 1** for data and **max 1** for computer system Data • Data needs protecting from someone **amending / deleting** or **taking** it Computer System • Computer system need protecting to stop people for example, installing malware or damaging the system	**2**
4(b)	**1 mark** for each correct threat, matching description and prevention e.g.	**6**
4(c)	**1 mark** per point to **max 2** • Data is turned into cipher text // Data is **encoded** • Used so that it cannot be **understood** if intercepted **without the decryption key**	**2**

Threat	Description	Prevention method
Virus	**Malicious software** that replicates itself and can corrupt data	Anti-virus / Firewall / Anti-malware
Hacker	Unauthorised access to the computer **with** malicious **intent**	Firewall / **strong** or biometric passwords / user permissions

Question	Answer	Marks
5(a)	**1 mark** for each correct relationship 	**2**
5(b)	**1 mark** per point • Neither key uniquely identifies each tuple by itself • One actor cannot appear in the same film twice so together they are unique	**2**

5(c)	**1 mark** per correct entry
	`SELECT` **`FILM_ACTOR.ActorID / ActorID`**
	`FROM FILM_ACTOR`
	`INNER JOIN` **`FILM_FACT`**
	`ON FILM_FACT.FilmID` **`= FILM_ACTOR.FilmID`**
	`WHERE FILM_FACT.FilmTitle =` **`"Cinderella"`** `;`
		4

5(d)	**1 mark** per point
	• COUNT and correct fieldname
	• SELECT and FROM statements, including the table name in FROM
	• WHERE statement
	e.g.
	`SELECT COUNT(FilmID)`
	`FROM FILM_FACT`
	`WHERE ReleaseDate >= #01/01/2022# AND ReleaseDate <= #31/01/2022#;`
	// `WHERE ReleaseDate BETWEEN #01/01/2022# AND #31/01/2022#;`
	// `WHERE ReleaseDate = "January 2022";`
		3

Question	Answer	Marks
5(e)	**1 mark** for each correctly completed term • data dictionary • field names // primary keys • primary keys //field names • logical schema • query • interface A DBMS provides data management. This includes the development of a **data dictionary** that stores information about the data stored, such as **field names** and **primary keys**. The **logical schema** uses methods such as an E-R diagram to show the structure of the database and its relationships. The **query** processor allows a user to perform searches to find specific data. The DBMS also provides a developer **interface** that allows the user to create tables, forms and reports.	**6**

Question	Answer	Marks
6(a)	**1 mark** per point to **max 2** e.g. • Attempts to **translate** the whole source code • Creates a separate error report at the end of the translation process • If translation successful / no errors creates an **executable** file	**2**
6(b)	**1 mark** per point to **max 2** e.g. • Reads each line then translates it **and executes** it • Stops when an error is encountered // displays errors where it finds them	**2**
6(c)	**1 mark** per point, **max 2** for writing, **max 2** for testing Writing e.g. • Enter code into an editor • Pretty printing to identify key terms • Context-sensitive prompts to help complete statements • Expand and collapse code blocks • Auto-complete to suggest what to type next • Auto-formatting to indent code blocks • Dynamic syntax checking Testing e.g. • Single stepping to run the code line by line • Breakpoints to stop the code at set points to check values • Report window to see how variables change	**4**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7</td><td>1 mark for first 4 rows, 1 mark for second 4 rows (shaded)

<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>0</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td></td><td>0</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>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr>
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<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>0</td></tr>
</table></td><td>2</td></tr>
</table>

Question	Answer	Marks
8	**1 mark** for identification of an application **Max 2 marks** for relevant description e.g. • Police identifying wanted people • Uses image recognition • ... to identify features/characteristics/items in an image • Natural language interfaces • Use speech recognition to identify words that are spoken • ... and adapts to learn regional accents • Self-driving cars • Detects its position on the road and within the traffic • Follows a route // Collision avoidance // Self-parking etc. • Spoken Interfaces • Use natural language processing • ... to take a sentence and work out its meaning • Game playing • Models characters in a computer game • ... to allow computer characters to react according to the player's movements	**3**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>1 mark for each completed name or description

<table>
<tr><th>Device</th><th>Description</th></tr>
<tr><td>Router</td><td>Receives and sends data between two networks operating on the same protocol</td></tr>
<tr><td>Wireless Network Interface Card (WNIC)</td><td>Hardware component that allows a device to connect to a wireless network // Provides a MAC address to the device to identify it on the wireless network</td></tr>
<tr><td>Repeater</td><td>Restores the digital signal so it can be transmitted over greater distances</td></tr>
<tr><td>Wireless Access Point (WAP)</td><td>Hardware component that provides radio communication from the central device to nodes on the network (and vice versa)</td></tr>
</table></td><td>4</td></tr>
<tr><td>9(b)</td><td>1 mark for each difference
e.g.
• Fibre optic data is transmitted using light, copper cable through electrical signals
• Fibre optic has higher bandwidth than copper cable // Fibre optic has higher transmission rates than copper cable
• Fibre optic has smaller risk of (noise) interference than copper cable
• Fibre optic can be used over longer distances than copper cable before repeaters are needed
• Fibre optic is much more difficult to hack into than copper cable
• Fibre optic is more prone to damage than copper cable</td><td>3</td></tr>
<tr><td>9(c)</td><td>1 mark per point to max 4

• A workstation / node (wishing to transmit) listens to the communication channel
• …data is only sent when the channel is free // ... if channel is free data is sent
• Because there is more than one computer connected to the same transmission medium
• ... two workstations can start to transmit at the same time, causing a collision
• If a collision happens, the workstations send a (jamming) signal / abort transmission
• …and each waits a random amount of time before attempting to resend</td><td>4</td></tr>
</table>