Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/12**

Paper 1 Written Paper **October/November 2019**

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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 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:

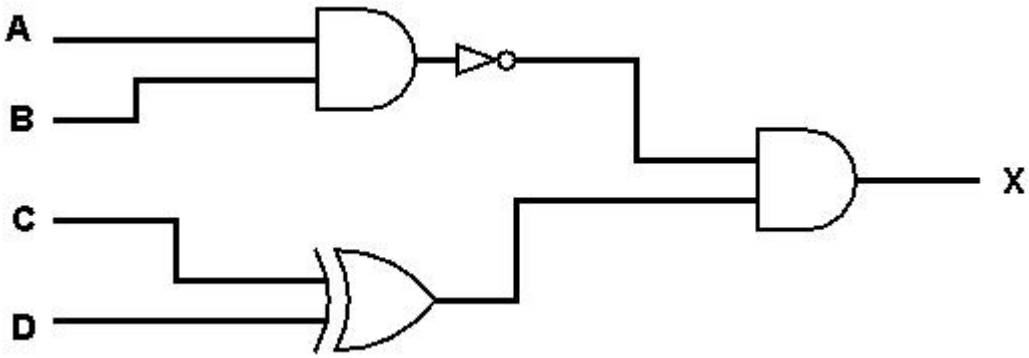
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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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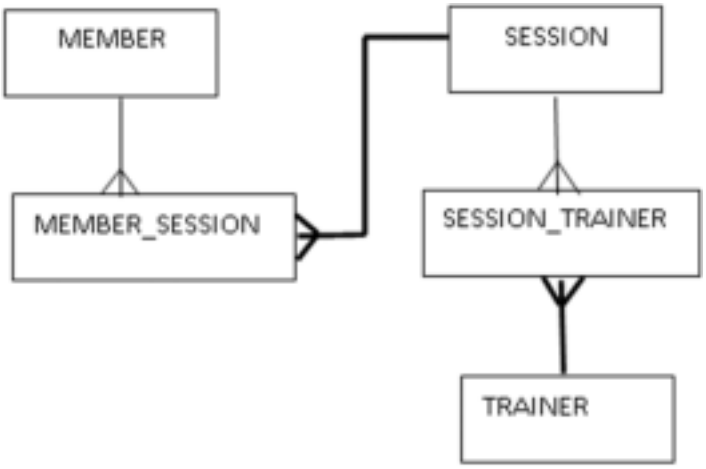
Question	Answer	Marks
1(a)	**1 mark** per correct line **Type of software** / **Description** Operating system → Provides an interface between the user and the hardware Utility program → An additional program that helps to maintain or configure the system Library program → Provides a ready-built routine that can be imported into a program Compiler → Converts source code into a low-level language Creates a new document for the user to edit	**4**
1(b)	**1 mark** per bullet point to **max 3** Disk repair: • Checks for any errors / inconsistencies / bad sectors on the disk • Resolves any errors on the disk • Retrieves files / data from a damaged disk // re-constructs directory // recovers disc when data corrupt • Marks bad sectors on the disk // marks bad sectors as unusable	**3**

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

</td><td>4</td></tr>
<tr><td>2(b)</td><td>1 mark for each pair of answers
<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>
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<tr><td>1</td><td>1</td><td>1</td><td></td><td>0</td></tr>
</table></td><td>4</td></tr>
</table>

Question	Answer	Marks
3(a)	**1 mark** per bullet point • `multiply` • `addition` • `value1`	**2**
3(b)	100	**1**
3(c)	To increment the value in `value1` (by one)	**1**

Question	Answer	Marks
3(d)	**1 mark** per bullet point to **max 2** • `value1` will still be a string // No conversion to integer • it will **concatenate** the digits together rather than add • by specific example e.g. if 3 is input, 33 will be output rather than 6	**2**

Question	Answer	Marks
4(a)(i)	**1 mark** per bullet point, **max 3 marks** from any group to **max 4** • Multiple tables are linked together • … which eliminates / reduces data redundancy / duplication • … and increases data integrity / consistency • … which reduces compatibility issues • … so data need only be updated once • … and associated data will be automatically updated // referential integrity can be enforced • … which eliminates unproductive maintenance // which makes it easier to maintain the data • Program-data independence means that • … the structure of data can change and does not affect program • … the structure of programs can change and does not affect data • … the data can be accessed by any appropriate program • Allows concurrent access to data • … by the use of record locking • … by restricting over-writing changes • Complex queries can be more easily written • ... to search / find **specific** data // specific example related to the sports club • Different users can be given different access rights • … which improves security • Different users can be given different views of the data • ... so they do not see confidential information • … and data privacy is maintained • … accept a valid example related to the sports club	**4**
4(a)(ii)	**1 mark** for each word in the correct position For a database to be in First Normal Form (1NF) there must be no **repeating** groups of attributes. For a database to be in Second Normal Form (2NF), it must be in 1NF, and contain no **partial** key dependencies. For a database to be in Third Normal Form (3NF), it must be in 2NF, and all attributes must be fully dependent on the **primary key**.	**4**

Question	Answer	Marks
4(b)(i)	**1 mark** for SESSION to MEMBER_SESSION (one-to-many) **1 mark** for TRAINER to SESSION_TRAINER (one-to-many) 	**2**
4(b)(ii)	`CREATE DATABASE SPORTS_CLUB;`	**1**

4(b)(iii)	**1 mark** per bullet point
	• `CREATE TABLE SESSION` and `( );`
	• `SessionID` as `char(4) / varchar / varchar(4) / text` and `Description` as `varchar / varchar(x) / char(x) / text`
	• `SessionDate` as `date` and `SessionTime` as `time`
	• `NumberMembers` as `integer / integer(2) / int / int(2)`
	• `SessionID` set as a Primary Key
	
	Example 1:
	`CREATE TABLE SESSION(`
	`SessionID Char(4),`
	`Description Varchar,`
	`SessionDate Date,`
	`SessionTime Time,`
	`NumberMembers Integer,`
	`PRIMARY KEY (SessionID)`
	`);`
	
	Example 2:
	`CREATE TABLE SESSION(`
	`SessionID Char(4)NOT NULL PRIMARY KEY,`
	`Description Varchar,`
	`SessionDate Date,`
	`SessionTime Time,`
	`NumberMembers Integer);`
		5

Question	Answer	Marks

4(b)(iv)	**1 mark** per bullet point
	• Select `FirstName` and comma and `LastName`
	• From `MEMBER`
	• Where `MembershipType = "Peak"`
	
	`SELECT FirstName, LastName`
	`FROM MEMBER`
	`WHERE MembershipType = "Peak";`
		3

Question	Answer	Marks
5(a)	**1 mark** per bullet point to **max 2** • Encryption • Assign a unique code so it will not install without this // product key • Limit the number of times that version of the software can be installed • Set a time limit within which the software must be installed	**2**
5(b)	• Provide an .exe file // Compile the source code // Use a compiler	**1**
5(c)(i)	**1 mark** per benefit to **max 2** • So that she can sell the software for a fee // make money from the software • A commercial licence prohibits unauthorised/further copies being made and/or distributed • A commercial licence prohibits any changes to the software	**2**
5(c)(ii)	**1 mark** per bullet point to **max 2** • Open Source • Free Software • Shareware • Freeware	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)(i)</td><td>1 mark for touchscreen being both
1 mark for remaining 3 devices

<table>
<tr><th>Device</th><th>Input</th><th>Output</th></tr>
<tr><td>Touchscreen</td><td>✓</td><td>✓</td></tr>
<tr><td>Webcam</td><td>✓</td><td></td></tr>
<tr><td>Microphone</td><td>✓</td><td></td></tr>
<tr><td>Fingerprint scanner</td><td>✓</td><td></td></tr>
</table></td><td>2</td></tr>
<tr><td>6(a)(ii)</td><td>1 mark for any 1 correct letter in the correct position
2 marks for any 2 correct letters in the correct positions
3 marks for any 3 correct letters in the correct positions
4 marks for 5 correct letters in the correct positions

C An electric current is sent to the speaker.

E The electric current passes through the coil.

The current in the coil creates an electromagnetic field.

A Changes in the audio signal cause the direction of the electrical current to change. This determines the polarity of the electromagnet.

D The electromagnet is repelled by, or attracted to the permanent magnet.

The movement of the coil causes the diaphragm to vibrate.

B The vibration creates sound waves.</td><td>4</td></tr>
<tr><td>6(b)(i)</td><td>To store files / software long term</td><td>1</td></tr>
<tr><td>6(b)(ii)</td><td>1 mark per bullet point to max 3

• No moving parts
• Solid state memory is non-volatile

• Makes use of blocks / arrays of
• … Semiconductors // NAND gates // NOR gates // transistors // integrated circuits
• SSD Controller manages the components
• Uses a grid of columns and rows that has two transistors at each intersection
• One transistor is called a floating gate
• The second transistor is called the control gate
• Memory cells store voltages which can represent either a 0 or a 1
• Essentially the movement of electrons is controlled to read/write
• Not possible to overwrite existing data // it is necessary to first erase the old data then write the new data in the same location</td><td>3</td></tr>
</table>

Question	Answer	Marks
6(c)	**1 mark** per bullet point to **max 2** • RAM stores currently running parts of files / programs / processes / OS • ROM stores boot up instructions / OS kernel // data permanently // store the firmware for the tablet	**2**
6(d)(i)	**1 mark** per bullet point to **max 4** **Max 3** for image **Max 3** for sound **Images** • The images are stored as bitmaps • Each image is **made up** of pixels • … each pixel is of a single colour • Each colour has a **unique** binary number • **Store** the sequence of binary numbers for each image / frame // **store** the binary value of each pixel **Sound** • Measure the height/amplitude of the sound wave • A **set number** of times per second // at **regular** time intervals • Each amplitude has a **unique** binary number • **Store** the sequence of binary numbers for each sample	**4**
6(d)(ii)	**1 mark** per bullet point **max 2** for each coding term. **Interlaced encoding** • The data from a single frame are encoded as two separate fields • One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines • The image is rendered by alternating between the even field and the odd field of each successive frame • The viewer sees data from two frames simultaneously • The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate) • Produces what appears to the eye to be a high refresh rate • Halves the transmission bandwidth requirements **Progressive encoding** • Stores the data for an entire frame • Displays all the frame data at the same time • The rate of picture display is the same as the frame rate • High bandwidth requirements	**4**

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Question	Answer	Marks
6(e)(i)	**1 mark** per bullet to **max 3** • The data is compressed before transmitting • The video is transmitted continuously as a series of bits • The video is hosted on a media server • On download, the server sends the data to a buffer on the client computers // The buffer stores the data from the server • The recipient / user's software receives bit stream from the buffer	**4**
6(e)(ii)	**1 mark** for: On-demand **1 mark** for justification from: • The video does not need to be broadcast live // the video is already recorded • Dominic's colleagues will watch the video at a later date // at their convenience	**2**
6(e)(iii)	**1 mark** per description **Temporal Redundancy** • Pixels in a sequence of **consecutive** video frames have the same value in the same location **Spatial Redundancy** • A sequence of **consecutive** pixels in a single video frame have the same value	**2**

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