CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/11**

Paper 1 Theory Fundamentals **May/June 2024**

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 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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:

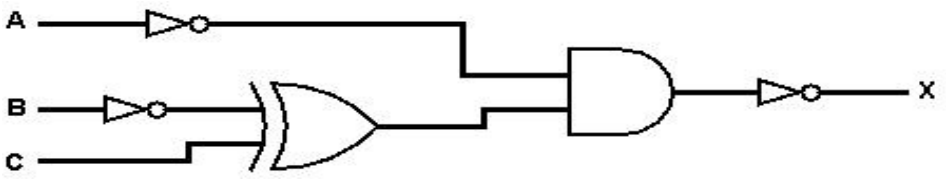
Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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.

Question	Answer	Marks
1(a)	**1 mark** for: (A XOR B) NOR C	**1**
1(b)	**1 mark** for NOT B XOR C **1 mark** for NOT A and final AND plus NOT  	**2**
2(a)	**1 mark** each **to max 2**: • The doorbell only performs the specific tasks of motion detection/video recording/doorbell ringing • The motion sensor and digital camera are built into the doorbell • The CPU/memory/storage/software are all dedicated to this task only • Only a dedicated microprocessor is required due to the limited processing requirements	**2**
2(b)	No mark for identification of monitoring or control **1 mark** each to **max 2** for justification: Monitoring: • The turning on of the digital camera does not affect the input to the sensor/button • The transmission of the data/video does not affect the input to the sensor/button • The ringing of the doorbell does not affect the input to the button Control: • Video doorbell does not only store the values from the motion sensor • The data is processed, generating a signal to start the digital camera recording • Button pressed/motion detected causes a signal to be sent over a network to the smartphone	**2**
2(c)(i)	**1 mark** each to **max 2**: • Current reading/data from motion sensor • Current/recent video • Instructions being executed • Start-up/BIOS/boot-up instructions	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(c)(ii)</td><td>1 mark for each row:

<table><tr><th>Statement</th><th>Answer</th></tr><tr><td>The two types of logic gate that can be used to create solid state devices</td><td>NAND
NOR</td></tr><tr><td>The number of transistors contained in each cell</td><td>2</td></tr><tr><td>The type of gate that can retain electrons without power</td><td>floating</td></tr><tr><td>The type of gate that allows or stops current from passing through</td><td>control</td></tr></table></td><td>4</td></tr>
<tr><td>2(c)(iii)</td><td>1 mark each to max 2:

• Captured video is transmitted to buffer
• … video is transmitted from buffer to smartphone
• Store recent data in a buffer for the user to rewind
• … instead of storing everything in secondary storage

• Store readings from motion sensor
• … until the microprocessor can process them
• Store video from digital camera
• … before moving it to secondary storage</td><td>2</td></tr>
<tr><td>2(d)</td><td>1 mark each to max 3:

• Data transmission to user’s smartphone will take longer
• … because there is more data to transmit

• The secondary storage device will fill faster
• … fewer videos will be able to be stored long-term // videos are overwritten more often</td><td>3</td></tr>
<tr><td>2(e)(i)</td><td>1 mark for:

Continuous ordered flow of bits over a communication path</td><td>1</td></tr>
<tr><td>2(e)(ii)</td><td>1 mark each to max 2:

• Real-time is direct from source whereas on-demand is pre-recorded/downloaded to view later
• Real-time cannot be re-watched, on-demand can be paused, re-watched etc.
• Real-time plays continually, on-demand downloads sections/blocks and cannot play until next section is downloaded</td><td>2</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>1 mark each to max 2:

• The interpreter will stop when an error is found
• ... so the error can be corrected in real-time, and the result of changes seen immediately

• Only one error is displayed at a time
• … so fewer errors to correct simultaneously and no dependent errors</td><td>2</td></tr>
<tr><td>3(b)</td><td>1 mark each to max 3:

• Program can be distributed without source code
• ... so it cannot be edited/stolen/plagiarised

• Users do not require the translator to run the program
• … so time is not spent retranslating by user</td><td>3</td></tr>
<tr><td>4(a)</td><td>1 mark for each correct answer:

<table>
<tr><th>Program Number</th><th>Code</th><th>ACC Content</th></tr>
<tr><td>1</td><td>LDD 20
ADD #2</td><td>4</td></tr>
<tr><td>2</td><td>LDX 22</td><td>5</td></tr>
<tr><td>3</td><td>LDI 25
INC ACC
SUB 22</td><td>1</td></tr>
<tr><td>4</td><td>LDD 19
LDM #5
LDM #25</td><td>25</td></tr>
</table>
</td><td>4</td></tr>
<tr><td>4(b)</td><td>1 mark for each correct answer:

<table>
<tr><th>Program Number</th><th>Code</th><th>ACC Content</th></tr>
<tr><td>1</td><td>AND 31</td><td>1001 1010</td></tr>
<tr><td>2</td><td>XOR B01001111</td><td>1101 0101</td></tr>
<tr><td>3</td><td>OR #30</td><td>1001 1110</td></tr>
</table>
</td><td>3</td></tr>
</table>

Question	Answer	Marks
5(a)	**1 mark** each: • Identification of server in the bank scenario • Description e.g. Receives requests, processes the requests • Identification of client in bank scenario • Description e.g. Sends request to the server, waits and outputs the response	**4**
5(b)	**1 mark** for each correctly completed term: • odd or even • 7-bits • odd • block • byte Computer A and Computer B agree on whether to use **odd or even** parity. Computer A divides the data into groups of **7-bits**. The number of 1s in each group is counted. If the agreed parity is **odd** and the group has an even number of 1s a parity bit of 1 is appended, otherwise a parity bit of 0 is appended. In a parity **block** check the bytes are grouped together, for example in a grid. The number of 1s in each column (bit position) is counted. A bit is assigned to each column to make the column match the parity. These parity bits are transmitted with the data as a parity **byte**.	**5**
5(c)(i)	**1 mark** each to **max 3**: • Compares all incoming and outgoing transmissions • ... against set criteria/whitelist/blacklist • Blocks all transmissions that do not meet rules • Blocks data entering from specific ports • Blocks unauthorised/unknown internal software transmitting data	**3**
5(c)(ii)	**1 mark** each to **max 4**: e.g. • Captures an image of the face • Uses image recognition • Trained to identify the features of a face in an image • … using a large number of images • Analyse images for facial features • Uses the probability of a match	**4**

Question	Answer	Marks

6(a)	**1 mark** each:
	
	• User table with the username as the Primary Key
	• … containing at least email address, date of birth / age and rating
	
	• Quiz table with Quiz ID or date or file name as the Primary Key.
	• … containing at least the other field(s) not used as the PK
	
	• A joining table with an appropriate name including at least fields for user identification, quiz identification and score
	• … with an appropriate Primary Key
	• ... and Foreign Keys matching the Primary Keys of the other two tables
	
	`USER(Username, Email, DateOfBirth, Rating)`
	`QUIZ(QuizID, Date, Filename)`
	`USER_QUIZ(Username, QuizID, Score)`
		6

6(b)	**1 mark** each to **max 2** for data dictionary and **max 2** for logical schema: Data dictionary: • Data about the data in the database // metadata • Identifies the characteristics of the data that will be stored • Appropriate example e.g. field names, table name, validation rules, data types, primary / foreign keys, relationships etc. Logical schema: • Conceptual design • Platform/database independent overview of the database • Is used to design the physical structure • Appropriate example e.g. Design of entities / E-R diagram / views	**4**

6(c)(i)	**1 mark** for each correct clause:
	
	• Alter table EVENT
	• Adding foreign key as PlayerID referencing correct table
	
	`ALTER TABLE EVENT`
	`ADD FOREIGN KEY(PlayerID)REFERENCES PLAYER(PlayerID);`
		2

6(c)(ii)	**1 mark** each:
	
	• Selecting PlayerID from EVENT
	• Counting EventID
	• Grouping by the PlayerID
	
	Example:
	`SELECT PlayerID, COUNT(EventID)`
	`FROM EVENT`
	`GROUP BY PlayerID;`
		3

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7</td><td>1 mark each:

• Working – carried values clearly indicted
• Correct answer 0001 1000
• Overflow clearly indicated as overflow

Example:

1 0 0 1 1 1 1 0
0 1 1 0 0 0 0 1
+ 0 0 0 1 1 0 0 1
(1) 0 0 0 1 1 0 0 0
1 1 1 1 1 1 1.....(carries)</td><td>3</td></tr>
<tr><td>8(a)</td><td>1 mark for each correct row:

<table><tr><th>Statement</th><th>Bus</th><th>Star</th><th>Mesh</th></tr><tr><td>all devices connect to one central device</td><td></td><td>✓</td><td></td></tr><tr><td>all devices connect to a central cable</td><td>✓</td><td></td><td></td></tr><tr><td>multiple paths for the packets to travel</td><td></td><td></td><td>✓</td></tr><tr><td>robust against damage because if any line fails, the rest of the network retains full functionality</td><td></td><td>✓</td><td>✓</td></tr><tr><td>most likely to lose data through collisions</td><td>✓</td><td></td><td></td></tr></table></td><td>5</td></tr>
<tr><td>8(b)(i)</td><td>1 mark for:

to be visible to and accessible by other devices on the internet</td><td>1</td></tr>
<tr><td>8(b)(ii)</td><td>1 mark each:

• IPv4 has 4 groups of digits whilst IPv6 has 8 groups
• IPv4 is usually represented in denary whilst IPv6 is usually represented in hexadecimal
• IPv4 groups are between 0 and 255 whilst IPv6 is between 0 and FFFF
• IPv4 is 32 bits whilst IPv6 is 128 bits</td><td>2</td></tr>
</table>

