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CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/12**

Paper 1 Theory Fundamentals **October/November 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 October/November 2024 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 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:

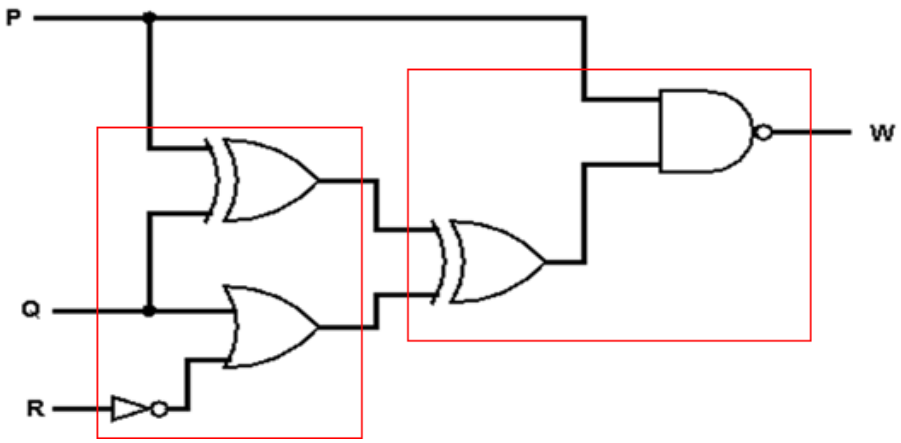
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>1 mark for each shaded part.

<table>
<tr><th>A</th><th>B</th><th>C</th><th>X</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table></td><td>2</td></tr>
<tr><td>1(b)</td><td>1 mark for (P XOR Q) and (Q OR NOT R)
1 mark for second XOR gate and final NAND gate with appropriate inputs


</td><td>2</td></tr>
</table>

Question	Answer	Marks
2(a)	**1 mark** for each bullet point (**max 3**) e.g. • It is difficult to change / update the firmware by the user • Errors cannot be fixed easily // Troubleshooting / fault-finding / repairing is a specialist task / expensive • Functionality cannot be changed/extended easily // Cannot be easily adapted for another task • Faulty / outdated devices are often thrown away rather than repaired • … leading to e-waste	**3**

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Question	Answer	Marks
2(b)	**1 mark** from: • DRAM is less expensive to manufacture/purchase than SRAM in the embedded system • DRAM has a higher bit density per chip // more data can be stored per chip	**1**
2(c)	**1 mark** for each bullet point (**max 2**) • EPROM uses ultraviolet light to erase data whilst EEPROM uses an electrical signal to do this • EPROM has to be removed from the circuit board when changing the data whilst EEPROM remains in the circuit when the data is changed • EPROM erases all the data, EEPROM can erase parts of the data	**2**

Question	Answer	Marks
3(a)	**1 mark** for each correct purpose **Register** / **Purpose** Program Counter (PC) / Stores the address of the next instruction to be fetched/executed Memory Address Register (MAR) / Stores the address of the memory location where data will be read from/written to Memory Data Register (MDR) / Stores the data read from the address in the MAR // stores the data to be written to the address in the MAR Index Register (IX) / Stores a number that will be added to the operand, to form the address of the data	**4**
3(b)	**1 mark** for each bullet point (**max 4**) e.g. • HDMI has faster transfer rates than VGA • … needed due to high resolution / large number of pixels of monitor // HDMI supports the high resolution of the monitor • HDMI supports video and audio transfer between computer and monitor speakers • … so no separate sound cable is needed unlike VGA • HDMI is digital interface therefore no data is lost in transfer to analogue and back • HDMI is less prone to error/crosstalk/external interference	**4**

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Question	Answer	Marks
3(c)	**1 mark** for each bullet point (**max 4**) e.g. • It manages the scheduling of processes // Decides which process is to be run next • Allows multi-tasking/multi-processing • Ensures fair access • Handles interrupts • Manages / allocates which resources the processes require • Facilitates the sharing and exchange of data between processes • Prevents interference between processes // conflict resolution	**4**

Question	Answer	Marks
4(a)	**1 mark** for each bullet point (**max 4**) e.g. • Single stepping • Run the program one line at a time • … and check the variable contents / program flow // show the effect of each line of code • Set breakpoints • … run the code up to a set line • ... and then check the status • Variable/report watch window • … view how the data changes as the program is running	**4**
4(b)	**1 mark** for each bullet point (**max 3**) e.g. • Subroutines can be shared / reused • … between team members who are working independently • … without having to rewrite/re-test them which saves the programmers' time • A program library provides continuity between programs/programmers • Individual programmers can contribute their specialisms to the library // Individual programmers can use the specialisms of others	**3**
4(c)	**1 mark** for the security method. **2 marks** for explanation Security method: Encryption Explanation • File contents are converted to cipher text • If intercepted the data cannot be understood without the decryption key	**3**

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Question	Answer	Marks
5(a)	**1 mark** for each bullet point **max 2** for public **max 2** for colleagues e.g. Colleagues: The programmer should: • Treat colleagues fairly and avoid acts of discrimination • Be prepared to accept / offer critique • … so that technical work can be improved • Credit the contributions of colleagues • … so that they feel valued / respected • Help / train colleagues etc. e.g. The public: The programmer should: • Maintain the health, safety and welfare of the public • … so as not to endanger anyone • Be honest / realistic in making claims about the software • … so that public trust is maintained • Maintain the security of the public's data etc.	**4**
5(b)(i)	Type of software licence **1 mark** for • Open Source Initiative // Free Software Foundation Reason for choice: **1 mark** for each bullet point (**max 2**) • Allows program source code to be examined • … so that the business can adapt/modify the program to meet their needs • Allows the programmer to earn money for the software and updates	**3**
5(b)(ii)	**1 mark** for each bullet point (**max 2**) • To identify themselves as the owner/author // To gain formal recognition of ownership • To allow for legal consequences if anyone steals/copies it • To restrict competition	**2**

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Question	Answer	Marks
6(a)	**1 mark** each to **max 3** e.g. • There is reduced data redundancy // less repeated data • … because each item of data is only stored once • Data consistency is maintained // Data integrity is improved • … changes in one table will automatically update in another • ... linked data cannot be entered differently in two tables • Program-data independence is ensured • … changes to the data do not require programs to be re-written // queries are not dependent on the structure of the data • Complex queries are easier to run • Different views can be provided • …. so users can only see specific aspects of the database • Multiple concurrent access is possible • ... through record locking	**3**
6(b)(i)	**1 mark** each to **max 6** • `CUSTOMER` to `JOB` is 1 to many • … implemented by Primary Key in `CUSTOMER` is Foreign Key in `JOB` • `EMPLOYEE` to `LOGIN_DATA` is 1 to 1 • … implemented by Primary Key in `EMPLOYEE` is Foreign Key in `LOGIN_DATA` • `JOB` to `JOB_EMPLOYEE` is 1 to many • … implemented by Primary Key in `JOB` is Foreign Key in `JOB_EMPLOYEE` • `EMPLOYEE` to `JOB_EMPLOYEE` is 1 to many • … implemented by Primary Key in `EMPLOYEE` is Foreign Key in `JOB_EMPLOYEE`	**6**

6(b)(ii)	**1 mark** each
	
	• Select SUM of Amount
	• From the correct table **and** one correct condition
	• Remaining correct condition
	
	Example:
	
	`SELECT SUM(Amount)`
	`FROM INVOICE`
	`WHERE Paid = "Y"`
	`AND DateSent >= #01/01/2023# AND DateSent <= #31/12/2023#`
		3

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Question	Answer	Marks
7(a)(i)	**1 mark** for each correct definition Colour depth: • the number of bits used to represent a colour // the number of colours that can be represented in an image File header: • stores data about the image file / metadata	**2**
7(a)(ii)	**1 mark** for each correct explanation Image quality: • Decreasing resolution means details within the image are lost because there are fewer pixels // Increasing resolution means the image is more detailed because there are more pixels File size: • Decreasing the resolution will decrease the file size because there are fewer pixels therefore less data // Increasing the resolution will increase the file size because there are more pixels therefore more data	**2**
7(a)(iii)	**1 mark** for correct method For example: • Run-Length Encoding	**1**
7(b)	**1 mark** for each correct definition Property: • an attribute of a drawing object // data about a shape // defines one aspect of the appearance of a drawing object Drawing list: • all the drawing objects/shapes in an image // stores the commands/descriptions / mathematical equations required to draw each object	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>1 mark for each correct content of the ACC (4)
1 mark for correct IX column

<table>
<tr><th></th><th>Instructions</th><th>ACC content</th><th>IX content</th></tr>
<tr><td>1</td><td>LDM #19
DEC ACC</td><td>18</td><td>20</td></tr>
<tr><td>2</td><td>LDD 23
ADD 19</td><td>40</td><td>20</td></tr>
<tr><td>3</td><td>LDI 25
INC ACC</td><td>5</td><td>20</td></tr>
<tr><td>4</td><td>LDR #21
LDX 2</td><td>15</td><td>21</td></tr>
</table></td><td>5</td></tr>
<tr><td>8(b)(i)</td><td>1 mark each correct content of ACC

<table>
<tr><th></th><th>Instructions</th><th>ACC content</th></tr>
<tr><td>1</td><td>LSL #2</td><td>0110 1000</td></tr>
<tr><td>2</td><td>ADD #5
AND #30</td><td>0001 1110</td></tr>
<tr><td>3</td><td>OR B11110010
INC ACC</td><td>1111 1011</td></tr>
</table></td><td>3</td></tr>
<tr><td>8(b)(ii)</td><td>1 mark each to max 2 for explanation

• An odd binary number will have a 1 in the Least Significant Bit (LSB)
• A bit manipulation operation is required to access/mask only the LSB and clear all the others
• Compare the result of the masking with denary 1
• … the result of the comparison will be true if the number is odd

1 mark for correct instruction

• AND B00000001 // AND #1 // AND &01</td><td>3</td></tr>
</table>

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Question	Answer	Marks
9(a)	**1 mark** for sensor **and** its use in this system • Infra-red sensor • Measure / check the height of the vehicle • Pressure sensor • Measure / check the weight of the vehicle	**2**
9(b)	**1 mark** for each bullet point (**max 2**) for a correct justification No marks for the identification of the system Monitoring system • Because there is no use of feedback // the warning sign is only an indicator • ... the output of the turning on of the sign does not affect the input of data from the sensors • The system does not have any actuators	**2**

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