Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/12**

Paper 1 Theory Fundamentals **May/June 2021**

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 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>1 mark for definition, 1 mark for appropriate example in each

<table>
<tr><th>Term</th><th>Definition and example</th></tr>
<tr><td>Field</td><td>A column/attribute in a table
e.g. <code>CustomerID</code> in the table <code>CUSTOMER</code></td></tr>
<tr><td>Entity</td><td>Anything that data can be stored about
e.g. A customer or a house</td></tr>
<tr><td>Foreign Key</td><td>A field in one table that is linked to a Primary Key in another table e.g. <code>CustomerID</code> / <code>HouseID</code> in table <code>RENTAL</code></td></tr>
</table></td><td>6</td></tr>
<tr><td>1(b)</td><td>1 mark per bullet point to max 2
• All fields in all tables are dependant fully on the PK and on no other fields
• for example all fields in <code>Customer</code> table are fully dependent on <code>CustomerID</code></td><td>2</td></tr>
<tr><td>1(c)(i)</td><td>1 mark for each correctly completed line

<pre>CREATE TABLE RENTAL(
    RentalID INTEGER NOT NULL,
    CustomerID INTEGER NOT NULL,
    HouseID VARCHAR (5) NOT NULL,
    MonthlyCost REAL/CURRENCY NOT NULL,
    DepositPaid BOOLEAN NOT NULL,
    PRIMARY KEY (RentalID)
);</pre></td><td>4</td></tr>
<tr><td>1(c)(ii)</td><td>1 mark per bullet point

• Select <code>FirstName</code> and <code>LastName</code>
• From both tables
• Where <code>DepositPaid = No</code>
• Joining tables (either <code>AND</code>, or <code>INNER JOIN</code>)

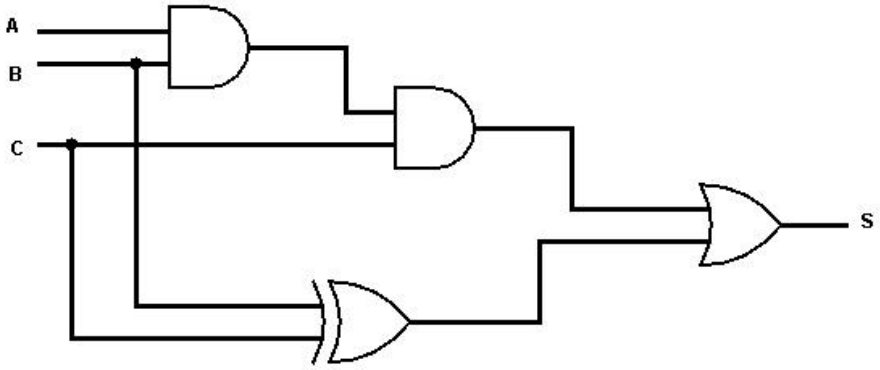
Example script:
<pre>SELECT FirstName, LastName
FROM CUSTOMER, RENTAL
WHERE DepositPaid = No
AND RENTAL.CustomerID = CUSTOMER.CustomerID;</pre></td><td>4</td></tr>
</table>

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

• To make sure the team members feel valued
• To get the best work out of the team
• To enable them to work well together
• To enable them to create the best product for the client</td><td>2</td></tr>
<tr><td>2(b)</td><td>1 mark per bullet point to max 3

• The rules / past moves / decision making algorithms of the game will be stored
• The AI program is trained, by playing many times
• AI will look (ahead) at possible moves
• ... and/or analyse the pattern of past choices
• … and choose the move most likely to be successful
• Computer could learn how to improve // learn from previous mistakes
• … by storing the positive/negative result of choices
• ... and changing its future choices</td><td>3</td></tr>
<tr><td>2(c)</td><td>1 mark for each correct column

<table>
<tr><th>Statement</th><th>Free Software Foundation</th><th>Open Source Initiative</th><th>Shareware</th><th>Commercial Software</th></tr>
<tr><td>The user can edit the source code</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>The user must always pay before being able to use the software</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>The user can redistribute the software</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>The user always gets a trial period</td><td></td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>4</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>1 mark for each correct gate, with correct inputs

</td><td>4</td></tr>
<tr><td>3(b)</td><td>1 mark for each half (shaded)
<table>
<tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>S</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>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>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr>
</table></td><td>2</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>

1 mark for each shaded section / bullet point

- Load 65 into ACC
- Load 100 into ACC, increment and store in 102
- Load 68 into ACC
- Load 101 into ACC, decrement and store in 102

<table>
<tr><th rowspan="2">Instruction address</th><th rowspan="2">ACC</th><th colspan="3">Memory address</th></tr>
<tr><th>100</th><th>101</th><th>102</th></tr>
<tr><td></td><td></td><td>68</td><td>65</td><td>100</td></tr>
<tr><td>70</td><td>65</td><td></td><td></td><td></td></tr>
<tr><td>71</td><td></td><td></td><td></td><td></td></tr>
<tr><td>72</td><td></td><td></td><td></td><td></td></tr>
<tr><td>73</td><td></td><td></td><td></td><td></td></tr>
<tr><td>74</td><td></td><td></td><td></td><td></td></tr>
<tr><td>76</td><td>100</td><td></td><td></td><td></td></tr>
<tr><td>77</td><td>101</td><td></td><td></td><td></td></tr>
<tr><td>78</td><td></td><td></td><td></td><td>101</td></tr>
<tr><td>79</td><td></td><td></td><td></td><td></td></tr>
<tr><td>70</td><td>68</td><td></td><td></td><td></td></tr>
<tr><td>71</td><td></td><td></td><td></td><td></td></tr>
<tr><td>72</td><td></td><td></td><td></td><td></td></tr>
<tr><td>80</td><td>101</td><td></td><td></td><td></td></tr>
<tr><td>81</td><td>100</td><td></td><td></td><td></td></tr>
<tr><td>82</td><td></td><td></td><td></td><td>100</td></tr>
<tr><td>83</td><td></td><td></td><td></td><td></td></tr>
<tr><td>(70)</td><td></td><td></td><td></td><td></td></tr>
</table>

</td><td>4</td></tr>
<tr><td>4(b)(i)</td><td>102</td><td>1</td></tr>
<tr><td>4(b)(ii)</td><td>AND</td><td>1</td></tr>
</table>

Question	Answer	Marks
4(b)(iii)	**1 mark** for AND, **1 mark** for #15 AND #15	**2**

Question	Answer	Marks
5(a)	**1 mark** for each term correctly inserted The **control unit/bus** transmits the signals to coordinate events based on the pulses of the (**system) clock**. The **data bus** carries data to components, while the **address bus** carries the address where data is being written to or read from. The **arithmetic logic unit/ALU** performs mathematical operations and logical comparisons.	**5**
5(b)	**1 mark** per bullet point to **max 3** per factor. **max 4** overall. Number of cores: • Each core processes one instruction per clock pulse • More/multiple cores mean that **sequences of instructions** can be split between them • … and so more than one instruction is executed per clock pulse // more **sequences of instructions** can be run at the same time • **More** cores decreases the time taken to complete task Clock speed: • Each instruction is executed on a clock pulse // one F-E cycle is run on each clock pulse • ... so the clock speed dictates the number of instructions that can be run per second • The **faster** the clock speed the more instructions can be run per second	**4**
5(c)(i)	**1 mark** per bullet point to **max 2** • Cloud storage can be free (for small quantities) • No need for separate (high capacity) storage devices // saves storage on existing devices • Can access data from any computer **with internet access** • Most cloud data services will have in-built backup/disaster recovery • Security could be better • Can easily increase capacity • Data can be easily shared	**2**

Question	Answer	Marks
5(c)(ii)	**1 mark** per bullet point to **max 2**: • Can only access (the cloud) with internet access • Security may not be strong // no control over security • There may not be any backups // no control over backups • It can take a long time to **upload/download** the data • It can be more expensive in the long term • There could be a limit to the amount of storage unless paid for • There could be compatibility/access issues • There could be issues with the company offering cloud services	**2**
5(d)	**1 mark** for each correct line **Term** / **Description** Public IP Address Private IP address Dynamic IP address Static IP address It is only visible to devices within the Local Area Network (LAN) It increments by 1 each time the device connects to the internet A new one is reallocated each time a device connects to the internet It can only be allocated to a router It is visible to any device on the internet It does not change each time a device is connected to the internet	**4**

Question	Answer	Marks
6(a)	1 mark for each correct answer ASCII = 128 // 2^7 Extended ASCII = 256 // 2^8	**2**
6(b)	**1 mark** per bullet point to **max 2** • Each character has its own **unique** code • Each character in the word is **replaced** by its code • The codes are stored **in the order in the word**	**2**

Question	Answer	Marks
6(c)(i)	31	**1**
6(c)(ii)	53	**1**

Question	Answer	Marks
7(a)	**1 mark** per bullet point to **max 2** • Program libraries store pre-written functions and routines • The program library can be referenced/imported • the functions/routines can be called in her own program	**2**
7(b)(i)	**1 mark** per bullet point to **max 4; max 3** from each section Interpreter: • Use an interpreter while writing the program • … to test/debug the partially completed program • … because errors can be corrected and processing continue from where the execution stopped // errors can be corrected in real time // errors are identified one at a time Compiler: • Use the compiler after the program is complete • … to create an executable file • Use the compiler to repeatedly test the same (completed) section • … without having to re-interpret every time // compiler not needed at run-time	**4**
7(b)(ii)	**1 mark** per correct tool to **max 2** e.g. • Breakpoints • Single stepping • Report windows	**2**

Question	Answer	Marks
8(a)	**1 mark** per bullet point • Security protects data against loss • Privacy protects data against unauthorised access	**2**
8(b)	**1 mark** for a correct answer • Two factor authentication • Biometric passwords • Key Card Access • Firewall	**1**

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Question	Answer	Marks
8(c)	**1 mark** per correct answer to **max 2** • Malware // viruses // spyware // by example • Hacking • Phishing • Pharming	**2**

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