Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/13**

Paper 1 Theory Fundamentals **October/November 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 October/November 2022 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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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>1 mark for one or two correct ticks, 2 marks for three correct ticks.

<table>
<tr><th>Action</th><th>Accuracy increases</th><th>Accuracy decreases</th><th>Accuracy does not change</th></tr>
<tr><td>Change the sampling rate from 40 kHz to 60 kHz.</td><td>✓</td><td></td><td></td></tr>
<tr><td>Change the duration of the recording from 20 minutes to 40 minutes.</td><td></td><td></td><td>✓</td></tr>
<tr><td>Change the sampling resolution from 24 bits to 16 bits.</td><td></td><td>✓</td><td></td></tr>
</table></td><td>2</td></tr>
<tr><td>1(b)</td><td>1 mark for answer; 1 mark for working.

Working:
Size = 50KHz * (20 × 60) * 16 bits
= 50 000 * 1200 * 16 bits // 50 000 *1200 * 2 bytes
= 960 000 000 bits
= 120 000 000 bytes
= 120 000 kilobytes
= 120 megabytes

Answer = 120 megabytes</td><td>2</td></tr>
<tr><td>1(c)</td><td>1 mark for purpose (max 2):

Purpose:
• to act as temporary storage // to store (downloaded) data
• ... before it is used by the receiving device
• ... to allow processes / devices to operate at different speeds // independently of each other

1 mark for each example (max 1):
Examples:
• printer buffer used when data is transferred from a computer to a printer
• video buffer when streaming videos
• keyboard buffer when performing data entry</td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>1 mark for each correct answer.

<table>
<tr><th>Item</th><th>Answer</th></tr>
<tr><td>a suitable field for the primary key in <code>COMPANY</code></td><td><code>CompanyID</code></td></tr>
<tr><td>a candidate key in <code>TELESCOPE</code></td><td><code>SerialNumber</code> // <code>TelescopeID</code></td></tr>
<tr><td>the degree of relationship between <code>TELESCOPE</code> and <code>PHOTOGRAPH</code></td><td>1:M / 1 to many</td></tr>
</table></td><td>3</td></tr>
<tr><td>2(b)</td><td>Logical schema</td><td>1</td></tr>
<tr><td>2(c)</td><td>1 mark for each correctly completed missing part:

<code>SELECT <u>COUNT</u> (<u>TelescopeID</u>)
FROM TELESCOPE
WHERE <u>CompanyID</u> LIKE <u>'HW%'</u>;</code></td><td>4</td></tr>
<tr><td>2(d)</td><td>1 mark for each bullet point:

• ALTER TABLE PHOTOGRAPH
• ADD Resolution TEXT;

<code>ALTER TABLE PHOTOGRAPH
ADD Resolution TEXT / VARCHAR(11);</code></td><td>2</td></tr>
<tr><td>2(e)</td><td>1 mark for each correctly completed term;

The <u>bit depth</u> of a bitmap image is the number of bits that are used to store each pixel.

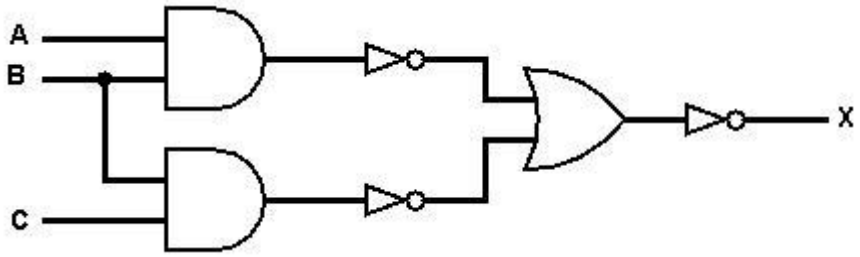
Metadata about the image is stored in the <u>header</u> of the file.</td><td>2</td></tr>
<tr><td>2(f)</td><td>1 mark for each bullet point (max 2):

• allows the user to enter criteria
• searches for the data that meets the entered criteria
• organises the results to be displayed to the user</td><td>2</td></tr>
</table>

Question	Answer	Marks
3	**1 mark** for each correct line: **OS Management task** / **Description** hardware management → installs programs for devices connected to external ports security management → validates user and process authenticity memory management → dynamically allocates memory to processes process management → allows processes to transfer data to and from each other marks unallocated file storage for availability	**4**

Question	Answer	Marks
4(a)(i)	**1 mark** for each register: MAR: • **holds** address in memory from which data will be read / to which data will be written MDR: • **holds** the data/instructions which has been read from or is to be written to the address in the MAR	**2**
4(a)(ii)	after completion of the execute stage // before the cycle begins	**1**
4(b)	**1 mark** for each bullet point (**max 2**): • synchronise operations • ... by creating timing signals • to keep track of the date and time / timestamp files • to process operations in the correct order / sequence	**2**

Question	Answer	Marks
4(c)	**1 mark** for identification of a correct upgrade: **1 mark** for a corresponding explanation: Examples: • increase quantity of RAM • ... so allowing more applications to reside in memory at the same time, saving disk access times • increase the size of cache memory • ... so that the CPU can continue working without waiting for data • increase clock speed • ... so that more instructions are performed in a time period • increase the number of processors / cores • ... so that more instructions are performed in parallel	**2**

Question	Answer	Marks
5(a)	**1 mark** for each bullet point: • NOT (A AND B) • NOT (B AND C) • NOT(NOT(A AND B) OR NOT(B AND C))  	**3**
5(b)	**1 mark** for each set of highlighted rows. **P** **Q** **R** **Y** 0 0 0 0 0 0 1 0 0 1 0 1 0 1 1 1 1 0 0 0 1 0 1 0 1 1 0 1 1 1 1 0	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)(i)</td><td>1 mark for each set of highlighted rows:

<table>
<tr><th rowspan="2">Instruction address</th><th rowspan="2">ACC</th><th rowspan="2">IX</th><th colspan="5">Memory address</th><th>Output</th></tr>
<tr><th>100</th><th>101</th><th>110</th><th>111</th><th>112</th><th></th></tr>
<tr><td></td><td></td><td></td><td>1</td><td>0</td><td>97</td><td>98</td><td>97</td><td></td></tr>
<tr><td>75</td><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>76</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>78</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>79</td><td>97</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>80</td><td>65</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>81</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>82</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>83</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>85</td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr>
<tr><td>86</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>87</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>88</td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>89</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>90</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>91</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>92</td><td>49</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>93</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr>
<tr><td>94</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td><td>4</td></tr>
<tr><td>6(a)(ii)</td><td>1 mark for each bullet point:

• To allow for re-locatable code
• ... because all (target) addresses can be specified by the base address + offset</td><td>2</td></tr>
</table>

Question	Answer	Marks
6(b)(i)	`0000 0100`	**1**
6(b)(ii)	`1101 1111`	**1**
6(b)(iii)	`0010 0111`	**1**
6(c)	**1 mark** for a correct name: • input and output of data • arithmetic operations • unconditional and conditional instructions • compare instructions	**1**

Question	Answer	Marks
7(a)	**1 mark** for each correct answer: **Answer** The name of device A that allows the laptop to connect to the internet: Router A type of cloud, X: Public (cloud) An example of an application, B, that can run on the cloud,: Email / Graphics / Word processor / Spreadsheet / Game / Database, etc.	**3**
7(b)	**1 mark** for a correct advantage: • not fixed to a single location • allows access in remote / rural areas **1 mark** for each correct disadvantage (**max 2**): • high latency / lag / slow to connect • more expensive than wired methods, as need extra equipment • signal is affected by **bad weather** • the transmission speed is slower than fixed line broadband • direct line of sight needed	**3**
7(c)(i)	**1 mark** for each bullet point (**max 2**) Examples: • improves security • reduces congestion • allows extension of the network / devices attached • aids day-to-day management • improves performance	**2**

Question	Answer	Marks
7(c)(ii)	**1 mark** for each correct answer: • network ID = 10 • host ID = 4	**2**

Question	Answer	Marks
8(a)(i)	**1 mark** for each bullet point (**max 2**): • to allow users to customise the code • to allow errors to be reported / identified / fixed by users • to allow additional features to be added to the code • to allow for collaboration	**2**
8(a)(ii)	**1 mark** for each correct point (**max 2**) Example: • enables the program to be copyrighted • prevents illegal changes to the program / protects the source code • prevents illegal copies of the program being made • a fee can be charged for the program	**2**
8(b)	**1 mark** for a correct economic impact and **1 mark** for corresponding description Example: • reduce costs to the garage • ... because less time taken for diagnosis • increase profits for the garage • ... as technicians spend more time repairing, so completing more jobs in a day • decrease costs passed to customer • ... so garage may gain customers • profit margins can be reduced • ... because program may be expensive to buy / maintain / update	**2**

Question	Answer	Marks
9(a)(i)	93	**1**
9(a)(ii)	147	**1**
9(b)	**1 mark** for each correct benefit (**max 2**) Examples: • straightforward to convert to / from BCD and denary • ... so it is less complex to encode and decode for programmers • easier for digital equipment use BCD to display output information • can represent monetary values exactly	**2**

Question	Answer	Marks
10(a)	**1 mark** for each bullet point: • to ensure the system operates with the given criteria • ... by enabling system output to affect subsequent system input • ... thus allowing conditions to be automatically adjusted	**3**
10(b)(i)	**1 mark** for identification of a suitable sensor **1 mark** for corresponding justification Example: • sound sensor • if a sound occurs inside the car the alarm is activated • infra-red sensor • senses the heat of person in the car / infra-red beams are broken • pressure sensor • an intruder sits in the driver's seat	**2**
10(b)(ii)	**1 mark** for each bullet point (**max 3**): • the embedded system is **built into** / integrated (into the car alarm) • combination of hardware and software designed for a **specific function** • must have a processor, memory and input / output • The system is **not easily changed**/updated by the car owner	**3**