



Cambridge O Level

COMPUTER SCIENCE

2210/01

Paper 1 Computer Systems

For examination from 2023

MARK SCHEME B

Maximum Mark: 75

Specimen

This document has **10** pages.

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.

Mark scheme abbreviations

- / separates alternative words / phrases within a marking point
- // separates alternative answers within a marking point
- underline** actual word given must be used by candidate (grammatical variants accepted)
- max** indicates the maximum number of marks that can be awarded
- ()** the word / phrase in brackets is not required, but sets the context

Note: No marks are awarded for using brand names of software packages or hardware.

Question	Answer	Marks																								
1(a)(i)	B	1																								
1(a)(ii)	C	1																								
1(b)	<ul style="list-style-type: none"> Data is processed in a computer by using logic gates that only have two states (0 or 1) 	2																								
1(c)	<p>Two marks for the correct answer (one mark per nibble). One mark for correct working in binary (showing carries).</p> $ \begin{array}{r} 0^1 \ 0^1 \ 1^1 \ 1^1 \ 1 \ 0 \ 0 \ 1 \\ + \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 1 \ 0 \\ \hline 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 1 \end{array} $	3																								
1(d)	<p>One mark for error name. Two marks for explanation.</p> <ul style="list-style-type: none"> Overflow The value is larger than 255 ... so all the bits required to represent the value cannot fit in the 8-bit register 	3																								
Question	Answer	Marks																								
2	<p>One mark for each correct parity bit.</p> <p style="text-align: center;">Parity bit</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Register A</td> <td style="border: 1px solid black; width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">Register B</td> <td style="border: 1px solid black; text-align: center;">1</td> <td style="border: 1px solid black; text-align: center;">1</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">Register C</td> <td style="border: 1px solid black; text-align: center;">1</td> <td style="border: 1px solid black; text-align: center;">1</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">0</td> <td style="border: 1px solid black; text-align: center;">1</td> </tr> </table>	Register A	1	0	1	0	1	0	1	Register B	1	1	0	0	0	0	1	Register C	1	1	0	0	0	0	1	3
Register A	1	0	1	0	1	0	1																			
Register B	1	1	0	0	0	0	1																			
Register C	1	1	0	0	0	0	1																			

Question	Answer	Marks
3(a)	<p>Any five from:</p> <ul style="list-style-type: none"> Data fetched from RAM is stored in the MDR Data from MDR is sent to ALU to be executed ALU performs calculation and logical operations on data ALU has a built-in register where it stores interim results of calculations After calculations, ALU sends data to MDR Data is sent from MDR to be written to RAM 	5
3(b)	<p>Any two from:</p> <ul style="list-style-type: none"> it is built into a device it has a single purpose/limited/dedicated function it runs on firmware it does not have additional peripherals. 	2
3(c)	<p>Any one from:</p> <ul style="list-style-type: none"> they both need to store boot-up instructions they both need data that should not be deleted. 	1

Question	Answer	Marks
4(a)	<p>One mark for the name of a security solution.</p> <p>Computer virus</p> <ul style="list-style-type: none"> Anti-malware/virus (software) Firewall <p>Hacking</p> <ul style="list-style-type: none"> Firewall, cannot be awarded if used for computer virus or spyware Passwords Biometrics Two-step verification <p>Spyware</p> <ul style="list-style-type: none"> Anti-malware/spyware (software), cannot be awarded if used for computer virus Two-step verification, cannot be awarded if used for hacking Firewall, cannot be awarded if used for computer virus or hacking 	3

Question	Answer	Marks
4(b)	<p>Two marks for each description.</p> <p>Anti-malware/virus (software)</p> <ul style="list-style-type: none"> • Scans the computer system (for viruses) • Has a record of known viruses • Removes/quarantines any viruses that are found • Checks data before it is downloaded • ... and stops download if virus found/warns user may contain virus <p>Anti-malware/spyware (software)</p> <ul style="list-style-type: none"> • Scans the computer for spyware • Removes/quarantines any spyware that is found • Can prevent spyware being downloaded <p>Firewall</p> <ul style="list-style-type: none"> • Monitors traffic coming <u>into and out of</u> the computer system • Checks that the traffic meets any criteria/rules set • Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist <p>Passwords</p> <ul style="list-style-type: none"> • Making a password stronger // by example • Changing it regularly • Lock out after set number of attempts // stops brute force attacks // makes it more difficult to guess <p>Biometrics</p> <ul style="list-style-type: none"> • Data needed to enter is unique to individual • ... therefore it is very difficult to replicate • Lock out after set number of attempts <p>Two-step verification</p> <ul style="list-style-type: none"> • Extra data is sent to device, pre-set by user • ... making it more difficult for hacker to obtain it • Data has to be entered into the same system • ... so if attempted from a remote location, it will not be accepted 	6

Question	Answer	Marks
5(a)	<p>One mark for each correct term, in the correct place.</p> <p>syntax high-level translator machine code assembly low-level</p>	6
5(b)	<p>Any three from:</p> <ul style="list-style-type: none"> • Code editor • Run-time environment • Translator • Error diagnostics • Auto-completion • Auto-correction • Prettyprinting 	3
Question	Answer	Marks
6(a)	<p>Any two from:</p> <ul style="list-style-type: none"> • Storage consisting of servers • ... that are often in a remote location • ... that are often maintained/backed up by a third-party company • Storage that is normally accessed using a network (often the internet) 	2
6(b)(i)	RAM	1
6(b)(ii)	<p>Any two from, e.g.:</p> <ul style="list-style-type: none"> • Hard disk drive/HDD • Solid-state drive/SSD • Any valid example of offline storage is also secondary storage e.g. CD/DVD (two can be awarded) 	2

Question	Answer	Marks
6(c)	<p>Any four from:</p> <ul style="list-style-type: none"> • The hard drive is partitioned to create virtual memory • When RAM is full • ... pages of data that are not required ... • ... are transferred from RAM to virtual memory • When the data is required again the pages are transferred back to RAM 	4

Question	Answer	Marks
7(a)	application software	1
7(b)	<p>Any two from e.g.:</p> <ul style="list-style-type: none"> • Division by zero • Two processes trying to access the same memory location • Any valid example of an error message (two examples can be awarded) • Any valid example of a change of task (two examples can be awarded) 	2

Question	Answer	Marks
8(a)	A currency that exists <u>only</u> in electronic form	1
8(b)	<p>Any two from:</p> <ul style="list-style-type: none"> • It acts as a ledger • ... by tracking each transaction • It keeps a series of time-stamped records • ... that cannot be altered 	2

Question	Answer	Marks
9	<p>Any five from:</p> <ul style="list-style-type: none"> • A (compression) algorithm is used • No data is removed in the process // original file can be restored • Repeated words/symbols (are identified) // Patterns in the data (are identified) • ... and are indexed/put into a table // by example • ... and are replaced with their index // by example • ... and their positions are stored (in the table) // by example • ... and the number of times the word/pattern appears is stored (in the table) // by example 	5

Question	Answer	Marks
10(a)	<ul style="list-style-type: none"> • It needs facts ... • ... to generate the rules • ... to make the decisions // The data it contains is essential to the decision making process 	3
10(b)	<ul style="list-style-type: none"> • Rule base • Inference engine • Interface 	3
10(c)	When a program has the ability to (automatically) adapt to its own processes and/or data	1
Question	Answer	Marks
11(a)	infrared sensor	1
11(b)	Type of integrated circuit that is contained on a single chip	2
11(c)	<p>Any six from:</p> <ul style="list-style-type: none"> • Sensor sends data/signal to microprocessor • Data/Signal is converted from analogue data to digital data (using ADC) • Value to compared to stored value(s) • If value is outside range / matches ... • ... <u>microprocessor</u> sends <u>signal</u> to switch lights on • ... actuator used to switch light on/off • ... timer is set for 2 minutes • Every time movement is detected the timer is reset • When timer reaches 0/120/times out <u>microprocessor</u> sends signal to switch lights off • <u>Process</u> is continuous 	6

