



Cambridge International AS & A Level

COMPUTER SCIENCE

9608/12

Paper 1 Written Paper

October/November 2020

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 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **11** printed 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.

Question	Answer	Marks
1(a)(i)	0001 0000 0101	1
1(a)(ii)	–65	1
1(a)(iii)	171	1
1(b)(i)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> Each character has a unique character code The <u>binary</u> value for each character in the string is stored in sequence ASCII codes may be 7 or 8 bits long 	2
1(b)(ii)	66 101 100	1
1(b)(iii)	72	1

Question	Answer	Marks
2(a)	<p>1 mark per bullet point to max 2 for description</p> <ul style="list-style-type: none"> Instead of storing each repeated sequence of <u>characters</u> individually ... the character is stored and the number of consecutive occurrences <p>1 mark for using relevant example e.g.</p> <ul style="list-style-type: none"> instead of storing aaaa , store a4 	3
2(b)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> Repeated sequences of characters rarely occur in text files // Most characters are used only once in any sequence The character code and the fact that it is stored once will both be stored, which will use as much if not more space 	2

Question	Answer	Marks
3(a)	<p>1 mark for each correct term</p> <p>Stored Memory Fetches Decodes Executes Registers</p> <p>The Von Neumann model uses the stored program concept.</p> <p>The program is a series of instructions that are saved in memory.</p> <p>The processor fetches each instruction, decodes it and then executes it.</p> <p>The processor uses several registers to store the data and instructions from the program because they can be accessed faster than main memory.</p>	6

Question	Answer					Marks																																																																																																																																	
3(b)(i)	1 mark for each set of shaded rows					5																																																																																																																																	
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4(a)	<p>1 mark for each pair of answers</p> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <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>1</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>0</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> </tbody> </table>	A	B	C	Working space	X	0	0	0		0	0	0	1		1	0	1	0		1	0	1	1		1	1	0	0		0	1	0	1		0	1	1	0		1	1	1	1		1	4
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4(b)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> AND is 1 only if both inputs are 1 NAND is 0 only if both inputs are 1 // NAND is 1 whenever both inputs are not 1 	2																																													

Question	Answer	Marks
5(a)	<p>1 mark per bullet point to max 4 Max 3 if all generic, descriptions not related to benefits to the teacher. Max 3 for a list with no expansions</p> <ul style="list-style-type: none"> • Linked tables can be set up • ... the teacher can set up tables for her students and their results and link them by common attributes • Reduced data redundancy • ... the teacher usually only needs to enter data once • Improved data integrity • ... e.g. if they are searching for a student's marks then all results for the student should be returned • Program-data dependence is overcome • ... e.g. the teacher can add the results for additional tests without affecting the data already stored • Privacy is improved • ... e.g. the teacher can prevent student access to the data (using views etc.) • Referential integrity can be enforced // Unwanted or accidental deletion of linked data is prevented • ... e.g. A teacher cannot enter a mark for a student that does not exist // the teacher cannot accidentally delete a student's record while there are test results for that student • More complex searches and queries can be executed • ... e.g. the teacher can set up a query to only return the test results for students who achieve below a certain mark 	4
5(b)(i)	<p>1 mark per bullet point to max 2</p> <p>The teacher can ...</p> <ul style="list-style-type: none"> • Set up forms for the input of student data • Add objects to a form to make data input easier, e.g. drop-down boxes • Design a report for the output of student marks • Add a menu to select options for different actions 	2
5(b)(ii)	<p>1 mark for each correct item to max 3</p> <p>For example:</p> <ul style="list-style-type: none"> • Table / entity names • Field / attribute names • Data types • Validation • Primary Keys 	3

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5(c)(i)	<p>1 mark for each correct example</p> <table border="1" data-bbox="308 315 1326 645"> <thead> <tr> <th data-bbox="308 315 552 383">Database term</th> <th data-bbox="552 315 938 383">Field name</th> <th data-bbox="938 315 1326 383">Table name</th> </tr> </thead> <tbody> <tr> <td data-bbox="308 383 552 510">Primary key</td> <td data-bbox="552 383 938 510">StudentID // TestID // StudentID <u>and</u> TestID</td> <td data-bbox="938 383 1326 510">STUDENT // TEST // STUDENT_TEST</td> </tr> <tr> <td data-bbox="308 510 552 577">Foreign key</td> <td data-bbox="552 510 938 577">StudentID // TestID</td> <td data-bbox="938 510 1326 577">STUDENT_TEST</td> </tr> <tr> <td data-bbox="308 577 552 645">Attribute</td> <td data-bbox="552 577 938 645">Any field from that table</td> <td data-bbox="938 577 1326 645">Any table</td> </tr> </tbody> </table>	Database term	Field name	Table name	Primary key	StudentID // TestID // StudentID <u>and</u> TestID	STUDENT // TEST // STUDENT_TEST	Foreign key	StudentID // TestID	STUDENT_TEST	Attribute	Any field from that table	Any table	3
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Foreign key	StudentID // TestID	STUDENT_TEST												
Attribute	Any field from that table	Any table												
5(c)(ii)	<p>1 mark for tick in correct box</p> <ul style="list-style-type: none"> • It is in 3NF <p>1 mark per bullet point to max 2 for justification:</p> <ul style="list-style-type: none"> • (It is in 1NF), there are no repeating groups of attributes // all attributes are atomic • (It is in 2NF), there are no partial dependencies • All fields are fully dependant on the PK // No transitive dependencies 	3												
5(c)(iii)	<p>1 mark for each correct answer</p> <pre>SELECT StudentID, Mark, MaxMarks / TEST.MaxMarks FROM STUDENT_TEST, TEST WHERE / WHERE Test.Topic = "Programming" AND TEST.TestID = STUDENT_TEST.TestID ;</pre>	5												

Question	Answer	Marks
5(c)(iv)	<p>1 mark for correct name and 1 mark for corresponding description <u>applied</u> to RESULTS database. Max 2 per rule to max 3 rules</p> <p>The descriptions are examples only, there are many correct answers</p> <ul style="list-style-type: none"> • Length check • Limit the target grade to 1 character • Range check • The mark for each test must be between 0 and MaxMarks • Existence check • The test topic must be in a pre-existing list • Presence check • A mark must be entered / not null • Format check • The data for a class must be one digit followed by one letter, e.g.3A • Type check • The maximum marks for a test must be an integer 	6
5(d)(i)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> • Stop unauthorised access // limit access to personal data about students • Prevent loss of data // avoid students' test mark being deleted. • Prevent unauthorised changes to data // prevent students changing grades 	2
5(d)(ii)	<p>1 mark per bullet point to max 3 for each, max 4 in total</p> <p>Backup</p> <ul style="list-style-type: none"> • A copy of the RESULTS database is made • ... at regular intervals // Sensible frequency of backups, e.g. daily, weekly etc. • ... and stored in a different location • So, in the event of data loss, (most of) the original data may be recovered. <p>Disk mirroring</p> <ul style="list-style-type: none"> • Data is written to different disks simultaneously • So, in the event of hardware failure, a second identical copy is immediately available. 	4

Question	Answer	Marks																
6(a)	<p>1 mark per bullet point to max 2</p> <p>For example:</p> <ul style="list-style-type: none"> • The manager is supporting her professional development • The manager is working in the best interest of his/her colleague (Malika) • This will ensure she is introduced to all aspects of the job • The manager is offering appropriate support 	2																
6(b)	<p>1 mark per bullet point to max 2</p> <p>For example:</p> <ul style="list-style-type: none"> • She is acting in her own best interest • ... by taking responsibility for her own professional development • She is acting in the best interests of her colleagues • ... by ensuring she is up-to-date and does not need further training 	2																
6(c)	<p>1 mark per bullet point to max 2</p> <p>For example:</p> <ul style="list-style-type: none"> • Discuss the problems with her • Discuss the concerns with her colleagues • Assign her a mentor who can reassure her • Team building exercises 	2																
7(a)	<p>1 mark for correct lines from IPv4, 1 mark for correct lines from IPv6</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border: none;">Characteristic</th> <th style="text-align: right; border: none;">IP address</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; padding: 5px;">Can use hexadecimal notation</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Each group of digits is a number between 0 and 65535</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Consists of four groups of digits</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Uses double colons (::)</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">The total length of the address is 32 bits</td> <td style="border: none;"></td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; text-align: center; padding: 10px;">IPv4</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; text-align: center; padding: 10px;">IPv6</td> </tr> </tbody> </table>	Characteristic	IP address	Can use hexadecimal notation		Each group of digits is a number between 0 and 65535		Consists of four groups of digits		Uses double colons (::)		The total length of the address is 32 bits			IPv4		IPv6	2
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7(b)	1 mark per bullet point to max 3 <ul style="list-style-type: none">• Static IP does not change whereas a dynamic IP address does change• ... the DNS does not need updating• ... which might be delayed causing 'address not found' errors• The webserver may be accessed directly using just the IP address // the IP address is still held in cache memory	3