Cambridge Assessment International Education

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.

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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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Question	Answer	Marks
1(a)(i)	0001 0000 0101	**1**
1(a)(ii)	–65	**1**
1(a)(iii)	171	**1**
1(b)(i)	**1 mark** per bullet point to **max 2** • Each character has a **unique** character code • The binary 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)	**1 mark** per bullet point to **max 2** for description • Instead of storing each **repeated sequence** of characters individually • … the character is stored and the number of consecutive occurrences **1 mark** for using relevant example e.g. • instead of storing aaaa , store a4	**3**
2(b)	**1 mark** per bullet point to **max 2** • 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)	**1 mark** for each correct term **Stored** **Memory** **Fetches** **Decodes** **Executes** **Registers** The Von Neumann model uses the **stored** program concept. The program is a series of instructions that are saved in **memory**. The processor **fetches** each instruction, **decodes** it and then **executes** it. The processor uses several **registers** to store the data and instructions from the program because they can be accessed faster than main memory.	**6**

Question	Answer	Marks
3(b)(i)	**1 mark** for each set of shaded rows	**5**

Instruction address	ACC	Memory address			Output
		80	81	82	
		10	2	0	
50	10				
51	20				
52		20			
53	0				
54	1				
55				1	
56					
57					
50	20				
51	40				
52		40			
53	1				
54	2				
55				2	
56					
57					
58	40				
59					(
60					

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(b)(ii)</td><td>1 mark for each correct column.

<table>
<tr><th rowspan="2">Instruction Group</th><th colspan="3">Assembly language instruction</th></tr>
<tr><th>STO 80</th><th>JPN 50</th><th>INC ACC</th></tr>
<tr><td>Input and output of data</td><td></td><td></td><td></td></tr>
<tr><td>Data movement</td><td>✓</td><td></td><td></td></tr>
<tr><td>Arithmetic operations</td><td></td><td></td><td>✓</td></tr>
<tr><td>Unconditional and conditional jump instructions</td><td></td><td>✓</td><td></td></tr>
<tr><td>Compare instructions</td><td></td><td></td><td></td></tr>
</table></td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>1 mark for each pair of answers

<table>
<tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</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>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>
</table></td><td>4</td></tr>
<tr><td>4(b)</td><td>1 mark per bullet point to max 2

• 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</td><td>2</td></tr>
</table>

Question	Answer	Marks
5(a)	**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 • 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 accidently 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)	**1 mark** per bullet point to **max 2** The teacher can ... • 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)	**1 mark** for each correct item to **max 3** For example: • Table / entity names • Field / attribute names • Data types • Validation • Primary Keys	**3**

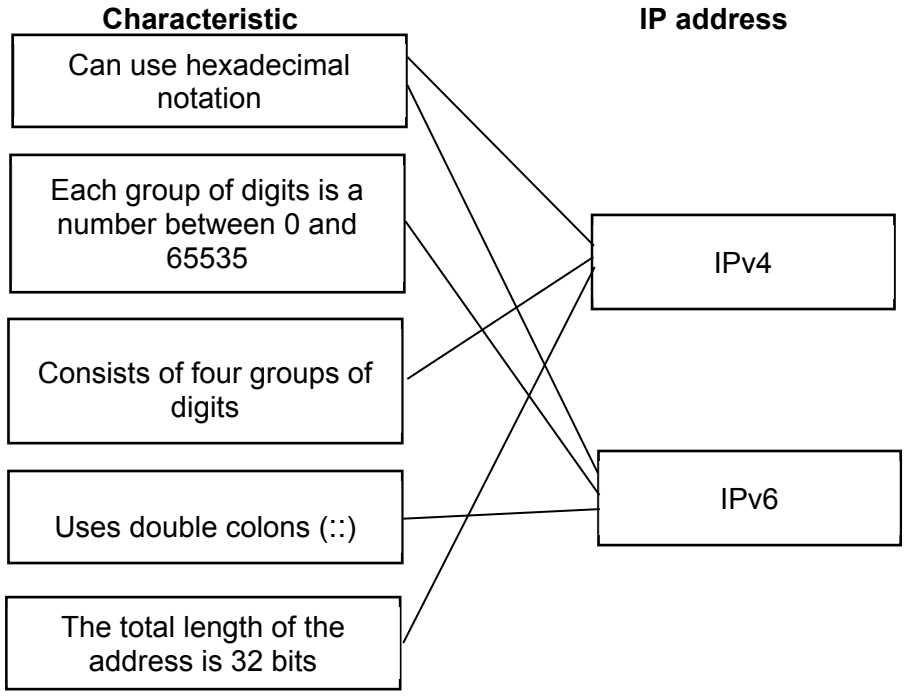
<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(c)(i)</td><td>1 mark for each correct example

<table>
<tr><th>Database term</th><th>Field name</th><th>Table name</th></tr>
<tr><td>Primary key</td><td>StudentID // TestID // StudentID and TestID</td><td>STUDENT // TEST // STUDENT_TEST</td></tr>
<tr><td>Foreign key</td><td>StudentID // TestID</td><td>STUDENT_TEST</td></tr>
<tr><td>Attribute</td><td>Any field from that table</td><td>Any table</td></tr>
</table></td><td>3</td></tr>
<tr><td>5(c)(ii)</td><td>1 mark for tick in correct box
• It is in 3NF

1 mark per bullet point to max 2 for justification:
• (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</td><td>3</td></tr>
<tr><td>5(c)(iii)</td><td>1 mark for each correct answer

SELECT StudentID, Mark, MaxMarks / TEST.MaxMarks
FROM STUDENT_TEST, TEST
WHERE / WHERE Test.Topic = "Programming"
AND TEST.TestID = STUDENT_TEST.TestID ;</td><td>5</td></tr>
</table>

Question	Answer	Marks
5(c)(iv)	**1 mark** for correct name and **1 mark** for corresponding description applied to `RESULTS` database. **Max 2** per rule to **max 3** rules The descriptions are examples only, there are many correct answers • 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)	**1 mark** per bullet point to **max 2** • 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)	**1 mark** per bullet point to **max 3** for each, **max 4** in total Backup • 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. Disk mirroring • 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)	**1 mark** per bullet point to **max 2** For example: • 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)	**1 mark** per bullet point to **max 2** For example: • 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)	**1 mark** per bullet point to **max 2** For example: • 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)	**1 mark** for correct lines from IPv4, **1 mark** for correct lines from IPv6  	**2**

Question	Answer	Marks
7(b)	**1 mark** per bullet point to **max 3** • 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**

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