Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/12**

Paper 1 Theory Fundamentals **October/November 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 October/November 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.

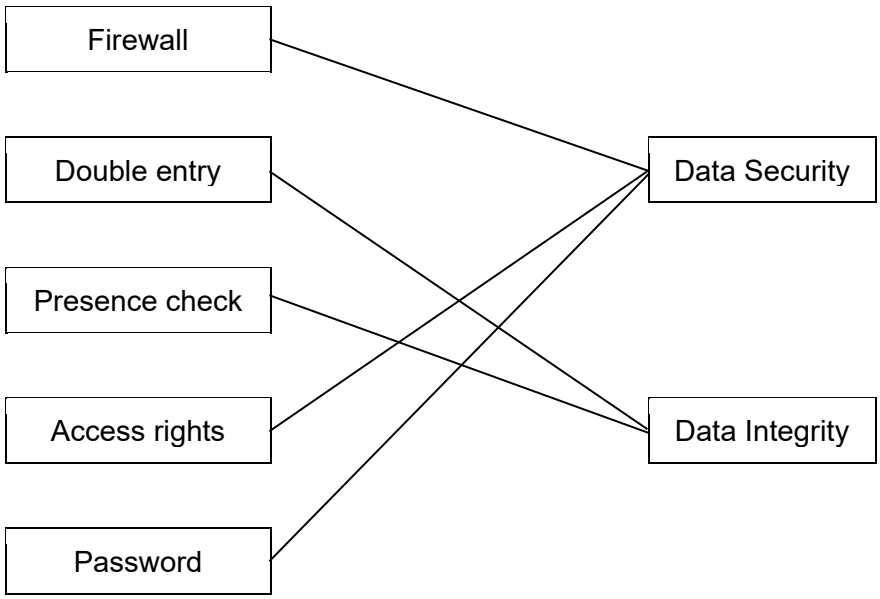
GENERIC MARKING PRINCIPLE 5:

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).

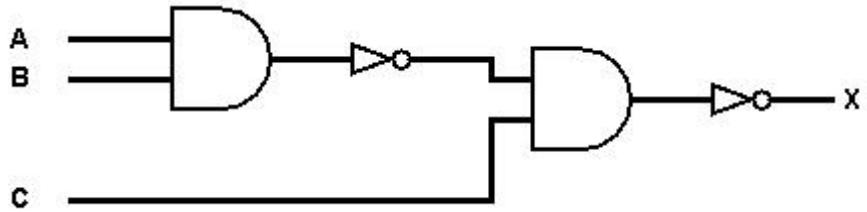
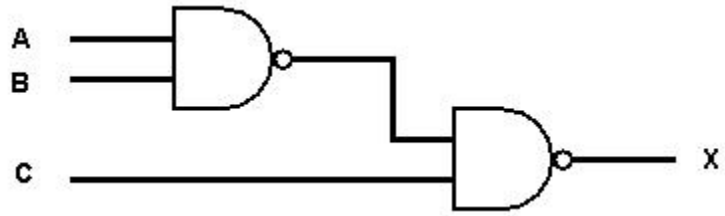
GENERIC MARKING PRINCIPLE 6:

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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Question	Answer	Marks
1	**1 mark** for 3 correct lines only from Data Security **1 mark** for 2 correct lines only from Data Integrity 	**2**

Question	Answer	Marks
2(a)	**1 mark** for each completely correct truth table **NOR** **A** | **B** | **Output** 0 | 0 | 1 0 | 1 | 0 1 | 0 | 0 1 | 1 | 0 **NAND** **A** | **B** | **Output** 0 | 0 | 1 0 | 1 | 1 1 | 0 | 1 1 | 1 | 0	**2**

Question	Answer	Marks
2(b)	**1 mark** for each correct bullet point • NOT (A AND B) // A NAND B • NOT the result AND C // the result NAND C  OR  	**2**

Question	Answer	Marks
3(a)	**1 mark** for each bullet point to **max 3** • The microphone has a diaphragm / ribbon • The incoming sound waves cause vibrations of the diaphragm • … causing a coil to move past a magnet // causing a magnet to move past a coil (dynamic microphone) // changing the capacitance (condenser microphone) // deforms the crystal (crystal microphone) • An electrical signal is produced	**3**
3(b)(i)	**1 mark** for identification of star topology **1 mark** for justification Devices are connected directly to the router independently // all devices are **only** connected to the router	**2**
3(b)(ii)	**1 mark** for each correct function to **max 3** • To receive packets from devices or the Internet • To forward / route packets to the destination • To find the destination of the packet • To assign / allocate private IP addresses to devices on LAN • To store / update / maintain a routing table • To find the most efficient path to the destination • To maintain a table of MAC and IP addresses	**3**

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Question	Answer	Marks
4(a)	205	**1**
4(b)	–51	**1**
4(c)	CD	**1**
4(d)	**1 mark** for: The denary value in each group of 4 bits is greater than 9 // the denary value in each nibble is greater than 9	**1**
4(e)(i)	**1 mark** for working, **1 mark** for answer 0011 1101 +0010 1101 **0110 1010** 111 1 1	**2**
4(e)(ii)	**1 mark** for working, **1 mark** for answer 0011 1101 +1101 0011 (two's complement) **0001 0000** 1111 111	**2**

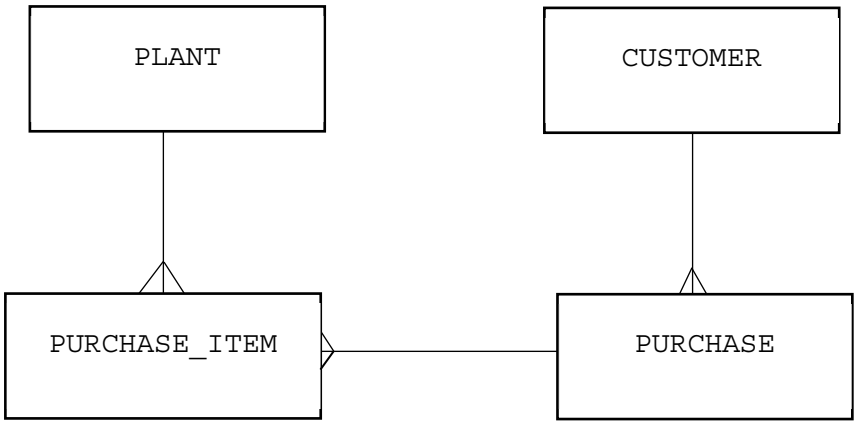
Question	Answer	Marks
5(a)	**1 mark** for each description,**1 mark** for each valid example	**4**

Term	Description	Example from logo
Property	data about the shapes // defines one aspect of the appearance of the drawing object	e.g. black line // white fill // black fill //solid (line) // font of letter // colour of triangle
Drawing list	the list of shapes involved in an image // a list that stores the command/description required to draw each object	e.g. triangle // capital letter R // rectangle // line

Question	Answer	Marks
5(b)(i)	**1 mark** for each bullet point to **max 2** for each difference • Bitmap made up of pixels // bitmap is made of colours stored for individual pixels • Vector graphic store a set of instructions about how to draw the shape • When bitmap is enlarged the pixels get bigger and it pixelates • When vector is enlarged it is recalculated and does not pixelate • Bitmap files are usually bigger than vector graphics files because of the need to store data about each pixel • Vector graphics have smaller file size because they contain just the instructions to create the shapes • Bitmap images can be compressed with significant reduction in file size • Vector graphic images do not compress well because of little redundant data	**4**
5(b)(ii)	**1 mark** for each bullet point to **max 2** for each method • Reduce bit depth • ... reduces the number of bits per colour / pixel which means each pixel has fewer bits • Reduce colour palette // reduce number of colours • ... fewer colours mean fewer bits needed to store each colour • Reduce image resolution • ... fewer pixels per unit measurement means less binary to store	**4**

Question	Answer	Marks
6(a)(i)	**1 mark** for 1 tick in the correct place **2 marks** for all 3 ticks correct	**2**

Task	Normalisation stage		
	0NF to 1NF	**1NF to 2NF**	**2NF to 3NF**
Remove any partial key dependencies		✓	
Remove any repeating groups of attributes	✓		
Remove any non-key dependencies			✓

Question	Answer	Marks
6(a)(ii)	**1 mark** for each correct relationship 	**3**
6(b)	**1 mark** for description of purpose • Stores metadata about the database **1 mark** for each example of contents to **max 2** e.g. • field / attribute names • table name • validation rules • data types • primary keys // foreign keys • relationships	**3**

6(c)(i)	**1 mark** for each correctly completed space
	
	`SELECT SUM(Quantity)`
	`FROM PURCHASE_ITEM`
	`WHERE PurchaseID = "3011A";`
		4

6(c)(ii)	**1 mark** per bullet point
	
	• ALTER TABLE PURCHASE
	• ADD OrderDate
	• Suitable data type, e.g. DATE
	
	`ALTER TABLE PURCHASE`
	`ADD OrderDate DATE;`
		3

Question	Answer	Marks
7(a)	**1 mark** per pair of rows (shaded & unshaded) | Event	Hardware Interrupt	Software Interrupt | |---|---|---| | Buffer full | | ✓ | | Printer is out of paper | ✓ | | | User has pressed a key on the keyboard | ✓ | | | Division by zero | | ✓ | | Power failure | ✓ | | | Stack overflow | | ✓ | 1 1 1	**3**
7(b)	**1 mark** for each bullet point to **max 4** • Storage space is divided into file allocation units • Space is allocated to particular files • Maintains / creates directory structures • Specifies the logical method of file storage (e.g. FAT or NTFS) • Provides file naming conventions • Controls access // implements access rights // implements password protection // Makes file sharing possible • Specifies tasks that can be performed on a file (e.g. open, close, delete, copy, create, move etc.)	**4**
7(c)	**1 mark** for identifying program **1 mark** for description, **max 2** per program e.g. • Defragmentation • Less time is taken to access files because each one is contiguous so there is less head movement • Virus checker • makes more RAM available for programs to run • ... because it removes software that might be taking up memory / replicating • Disk repair / Disk contents analysis • preventing bad sectors being used because it identifies / marks them • reduces access times by optimising storage • Disk/system clean up • releases storage by removing unwanted / temporary files	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)(i)</td><td>1 mark for each bullet point to max 2 for each register

MAR
• Stores the next address to be fetched
• ... held in the Program Counter (PC)
• The data at this address is then fetched

MDR
• Stores the data from the address pointed to by the MAR
• The data in it is copied to the Current Instruction Register (CIR)</td><td>4</td></tr>
<tr><td>8(a)(ii)</td><td>1 mark for a correct register
e.g.
Program Counter (PC)
Current Instruction Register (CIR)
Status register
Interrupt register</td><td>1</td></tr>
<tr><td>8(b)(i)</td><td>1 mark for each correct answer

<table><tr><th>Current contents of the ACC</th><th>Instruction</th><th>New contents of the ACC</th></tr><tr><td>01010101</td><td>XOR 101</td><td>1010 0101</td></tr><tr><td>11110000</td><td>AND 104</td><td>1111 0000</td></tr><tr><td>00001111</td><td>LSL #4</td><td>1111 0000</td></tr><tr><td>11111111</td><td>OR 102</td><td>1111 1111</td></tr></table></td><td>4</td></tr>
<tr><td>8(b)(ii)</td><td>1 mark for each correct instruction

<table><tr><th>Instruction Group</th><th>Instruction</th></tr><tr><td>Data movement</td><td>LDM #2</td></tr><tr><td>Input and output of data</td><td>IN / OUT</td></tr><tr><td>Arithmetic Operations</td><td>INC ACC / INC IX</td></tr><tr><td>Unconditional and conditional instructions</td><td>JPN 100 / JMP 100</td></tr><tr><td>Compare instructions</td><td>CMP 100</td></tr></table></td><td>4</td></tr>
</table>

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Question	Answer	Marks
8(b)(iii)	**1 mark** for name, **1 mark** for description • Indirect addressing • the address to be used is at the given address • Relative addressing • the address to be used is an offset number of locations away, relative to the address of the current instruction • Indexed addressing • form the address from the given address plus the contents of the index register	**2**