Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9608/11**

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.

[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.

Question	Answer	Marks

1(a)(i)	An individual shape (in a vector graphic)
	// a shape defined using mathematics/geometry
	// a distinct element within an image
	// possible to alter without affecting the other objects within the image
		1

1(a)(ii)	**One mark** per bullet point to **max 4** E.g. • Line colour • Line width • Fill colour • Shape • Outline style • Dimensions / size • Position	**4**
1(b)	**One mark** per bullet point to **max 3** E.g. • Dimensions e.g.100 × 100 pixels // image size • File size • Colour depth // bit depth • Location/offset of data within the file • Compression type • Confirmation that it is a bitmap // filetype • Image resolution • Colour palette	**3**
1(c)	**One mark** per bullet point to **max 2** for each method. Lossy • Reduce the resolution • …fewer pixels per unit measurement • …fewer pixels / binary numbers are stored • Reduce the colour depth • …reduce the number of bits per colour • …each pixel has fewer bits Lossless • RLE (Run Length Encoding) • ...looks for runs of consecutive **pixels** of the same colour • ...stores the colour value once and the number of times it occurs	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>One mark per correct definition

<table><tr><th>Term</th><th>Definition</th></tr><tr><td>Sampling</td><td>Measuring the amplitude of the wave at regular/set time intervals</td></tr><tr><td>Sampling resolution</td><td>The number of bits used to represent each sample</td></tr><tr><td>Sampling rate</td><td>The number of samples taken per unit of time</td></tr></table></td><td>3</td></tr>
<tr><td>2(b)</td><td>One mark per bullet point to max 2

• The data from a single frame are encoded as two separate fields
• One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines
• The image is rendered by alternating between the even field and the odd field (of each successive frame)
• The viewer sees data from two frames simultaneously
• The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate)
• Produces what appears to the eye to be a high refresh rate
• Halves the transmission bandwidth requirements</td><td>2</td></tr>
</table>

Question	Answer	Marks
3	**One mark** for each correct letter in the correct position 1 The browser requests the web page from the web server. **2 E** **3 A** 4 The web server produces the HTML code for the web page. **5 D** **6 C**	**4**

Question	Answer	Marks
4(a)	**One mark** per bullet point to **max 2** E.g. • Optical Disc Drive // CD/DVD Drive/Writer • Solid State Drive // USB Flash drive	**2**

Question	Answer	Marks
4(b)	**One mark** per bullet point to **max 4** • Main component of a scanner is a CCD (Charge Couple Device) array • CCD is a collection of light sensitive diodes • Laser beam / light shines onto the source document/barcode • The scanned image reaches the CCD through mirrors and lenses • Sensors detect levels of reflected light • Brighter light results in greater electrical charge • Light intensity is converted (by software) to a digital value	**4**
4(c)	**One mark** for correct lines from each type of RAM **Type of RAM** / **Description** SRAM DRAM Is less expensive to manufacture Needs to be refreshed Has more complex circuitry Is often used as cache Has faster access time	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5</td><td>One mark per pair of rows (shaded and unshaded)

<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>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td></td><td>0</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>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td></td><td>0</td></tr>
</table></td><td>4</td></tr>
</table>

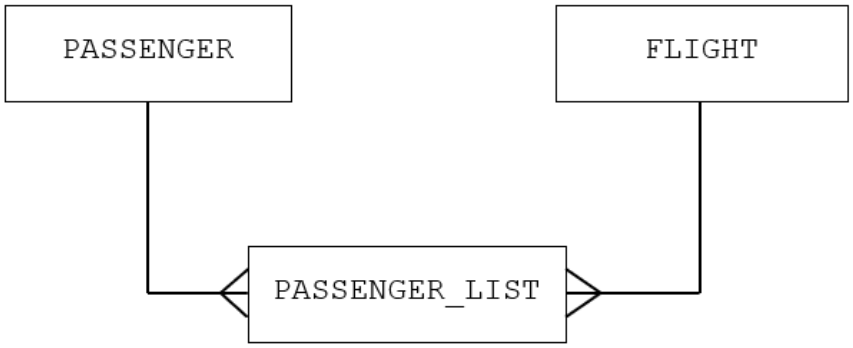
Question	Answer	Marks
6(a)	**One mark** for each term in bold. There are **three** buses that transfer data between components in a computer system. The width of the **address bus** determines the number of directly accessible memory locations. The **control unit** sends signals on the **control bus** to direct the operation of system components. **Clock** pulses are used to synchronise the components on the motherboard.	**5**
6(b)	**One mark** per bullet point to **max 5** • The address in the program counter is the address of next item to be fetched • The address is copied into MAR ... • …using the address bus • The instruction from that address moved/copied from main memory to MDR ... • …using the data bus • The instruction is transferred from MDR to CIR • The processor's instruction set is used to decode the instruction// the instruction is decoded in the CIR • …into op code and operand • The processor executes the instruction // the processor processes the data as required • The address in PC is incremented ready for next loop	**5**

Question	Answer	Marks
7(a)(i)	**One mark** per bullet point to **max 3** • Prevents two processes occupying the same memory space • Organises memory e.g. paging/segmentation • Makes uses of virtual memory • Keeps track of allocated and free memory locations • Allocates memory to processes • Ensures fair use of memory • Releases memory when a process stops	**3**
7(a)(ii)	**One mark** per bullet point to **max 2** • Installs drivers • Sends/receives data from a buffer // buffer management // • Sends commands to the device • Receives/handles messages/signals/interrupts from the device • Control of hardware usage by processes • Device detection • Power management • Keep track of device status (free or busy)	**2**
7(b)	**One mark** for name and one for description × 2, **max 4** The description must match the name • Virus/Malware checker • …scans disk for viruses and reports, quarantines or deletes them • File compression • …reduces the size of a file • Back up • …creates a copy of data in case of loss, so that the images can be restored • Defragmenter • …finds files that are not stored in contiguous blocks and moves them together • Disk formatter • …creates a logical drive on a hard drive // reformats a previously used hard drive // creates logical partitions // prepares a disk for first use • Disk repair/Disk contents analysis • …attempts to recover damaged files // checks disk for space and usage // to identify/mark the errors / bad sectors	**4**

Question	Answer	Marks
7(c)	**One mark** per bullet point to **max 3** • Already tested • Should be relatively free from errors // more robust • Used by many others • Make use of another programmer's knowledge • Precompiled • Saves (programming/testing) time	**3**

Question	Answer	Marks
8	**One mark** for each set of rows (shaded and unshaded)	**4**

Instruction address	ACC	Memory address				
		150	**151**	**152**	**153**	**160**
		13	23	11	0	150
130	13					
131	13					
132					13	
133	150					
134	151					
135						151
136						
130	23					
131	36					
132					36	
133	151					
134	152					
135						152
136						

Question	Answer	Marks
9(a)	**One mark** per correct relation  	**2**

9(b)	**One mark** per bullet point
	• Create table `FLIGHT` with open and close brackets (and ;)
	• `FlightID` as `VARCHAR` restricted to max 6
	• `FlightDate` as `DATE`
	• `FlightTime` as `TIME`
	• Declaring `FlightID` as Primary Key
	Example
	`CREATE TABLE FLIGHT (`
	`FlightID VARCHAR(6),`
	`FlightDate DATE,`
	`FlightTime TIME,`
	`PRIMARY KEY (FlightID));`
		5

Question	Answer	Marks
10(a)	**One mark** per bullet point to **max 3** • Easier de-bugging • Errors can be corrected in real time • Errors are reported as the interpreter finds them. • An error can be corrected and translation continued from where it stopped • The effect of any change made to the code can be seen immediately • Parts of the program can be tested, without all the program code being available.	**3**

10(b)	**One mark** for a correct answer
	Source code is needed at run time
	// No executable file produced, (so source code can be edited)
	// Translation software needed every time the program is run
	// execution time increased
		1

Question	Answer	Marks
11(a)	**One mark** per bullet point to **max 2** • Web pages/files are saved on servers • Clients send requests to the web servers • Web servers process the requests • …and return the results to the client • ... client displays the results to the user	**2**
11(b)	**One mark** per bullet point to **max 3** IPv4 • Four groups of (denary or Hexadecimal integers • Numbers between 0 and 255 / 0 and FF • Each stored in 1 byte / 8 bits // the whole is stored in 32 bits / 4 bytes • Separated by full stops • Correct example **OR** IPv6 • Eight groups of (Hexadecimal) digits • Numbers between 0 and FFFF • Each stored in 2 bytes/16 bits // the whole stored in 128 bits / 16bytes • Separated by colons • The first instance of multiple groups of zero can be replaced by a double colon • correct example	**3**