Cambridge Assessment International Education

# Cambridge International AS & A Level

**COMPUTER SCIENCE** **9618/11**

Paper 1 Theory Fundamentals **May/June 2023**

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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

## 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.

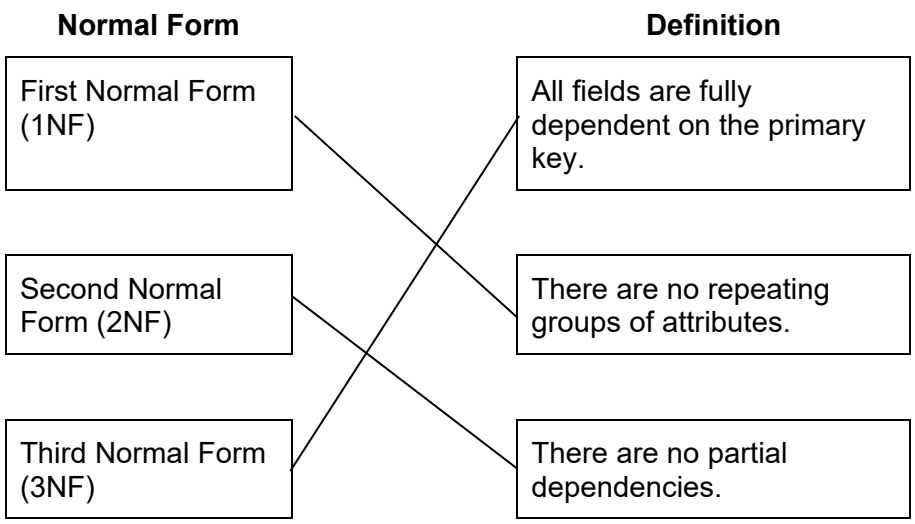
GENERIC MARKING PRINCIPLE 5:

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.

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>1 mark for each correct definition<br><br>
<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>Drawing list</td><td>All the drawing objects in an image // a list that stores the commands required to draw each object</td></tr>
<tr><td>Pixel</td><td>The smallest part of the image // one square / dot of one colour</td></tr>
<tr><td>Colour depth</td><td>The number of bits per pixel // determines the number of colours that can be represented in the image</td></tr>
</table></td><td>3</td></tr>
<tr><td>1(b)(i)</td><td>1 mark each<br><br>Examples:<br>• Confirmation that it is a bitmap // file type<br>• Compression type<br>• Location/offset of data within the file<br>• Dimensions e.g.100 × 100 pixels</td><td>2</td></tr>
<tr><td>1(b)(ii)</td><td>1 mark for working; 1 mark for answer<br><br>• Working: (1500 * 3000 * 8) / 1000 / 1000<br><br>• Answer: 36 MB</td><td>2</td></tr>
<tr><td>1(c)(i)</td><td>1 mark each<br><br>Examples:<br>• The customers will be able to download the photographs in less time<br>• …and they will take less of the customer's bandwidth<br>• The photographs will take up less space on the customer's storage medium<br>• …therefore the customers can store more images<br>• …and will have more space for other files</td><td>3</td></tr>
<tr><td>1(c)(ii)</td><td>1 mark each to max 2 for explanation; 1 mark for an image related example<br><br>• RLE stores a colour and the number of times it occurs consecutively<br>• An image may not have many sequences of the same colour<br>• It would need to store each colour and then the count/number 1 which adds data<br><br>Example:<br>• Red-Green-Blue would become Red 1 Green 1 Blue 1</td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(i)</td><td>1 mark for definition:<br><br>• Data about the data in the database // data about the structure of the database // metadata for a database<br><br>1 mark for a suitable example<br>Examples:<br>• table names<br>• data types<br>• field names</td><td>2</td></tr>
<tr><td>2(a)(ii)</td><td>1 mark for definition<br><br>• Methods of making sure the data is consistent<br><br>1 mark for example<br>Examples:<br>• Enforcing referential integrity<br>• If data in one table is deleted/edited all tables are updated // cascading update/delete<br>• Validation/verification rules</td><td>2</td></tr>
<tr><td>2(b)(i)</td><td>1 mark for each field name and table<br><br><table><tr><th>Foreign key</th><th>Database table</th></tr><tr><td>BirdID</td><td>BIRD_SEEN</td></tr><tr><td>PersonID</td><td>BIRD_SEEN</td></tr></table></td><td>2</td></tr>
<tr><td>2(b)(ii)</td><td>1 mark for all 3 correct lines<br><br> 
</td><td>1</td></tr>
</table>

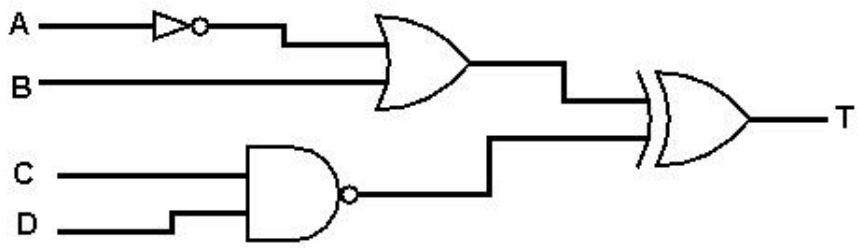
| Question | Answer | Marks |
|---|---|---|
| 2(b)(iii) | **1 mark** each<br><br>• CREATE TABLE start and end bracket<br>• Bird ID as CHAR/VARCHAR<br>• Name **and** size as VARCHAR/CHAR<br>• Bird ID as primary key<br><br>Example answer:<br>`CREATE TABLE BIRD_TYPE(`<br>`  BirdID CHAR(4) NOT NULL,`<br>`  Name VARCHAR(9),`<br>`  Size VARCHAR(6),`<br>`  PRIMARY KEY (BirdID)`<br>`);` | **4** |
| 2(b)(iv) | **1 mark** for each correctly completed space<br><br>`SELECT BIRD_TYPE.Size, COUNT(BIRD_TYPE.BirdID) AS NumberOfBirds`<br><br>`FROM BIRD_TYPE, BIRD_SEEN`<br><br>`WHERE BIRD_SEEN.PersonID = "J_123"`<br><br>`AND BIRD_TYPE.BirdID = BIRD_SEEN.BirdID`<br><br>`GROUP BY BIRD_TYPE.Size;` | **5** |

| Question | Answer | Marks |
|---|---|---|
| 3(a) | **1 mark** each to **max 4**<br><br>Examples:<br>• **Installs** device drivers<br>• … to allow communication between peripherals and computer<br>• Sends data and receives data to and from peripherals<br>• … such as to an output device and from an input device/by example<br>• Handles buffers for transfer of data<br>• … to ensure smooth transfer between devices that transmit and receive at different speeds<br>• Manages interrupts / signals from the device | **4** |
| 3(b) | **1 mark** each to **max 2**<br><br>• Memory management<br>• File management<br>• Security management<br>• Process management<br>• Error checking and recovery | **2** |

| Question | Answer | Marks |
|---|---|---|
| 3(c) | **1 mark** each to **max 3**<br><br>• Rearranges blocks of individual files (on the HDD) so they are contiguous // moves the free space together<br>• Accessing each file is faster<br>• …because there is no need to search for the next fragment / block of the file<br>• …so less head movement is needed | **3** |
| 3(d)(i) | **1 mark** from<br><br>• Kibibyte is 1024 bytes and kilobyte is 1000 bytes<br>• Kibibyte is binary prefix and kilobyte is denary prefix | **1** |
| 3(d)(ii) | 1001 0110 0100 | **1** |
| 3(d)(iii) | F2 | **1** |
| 3(d)(iv) | Smallest: 10000000<br>Largest: 01111111 | **2** |
| 3(d)(v) | **1 mark** for working<br>**1 mark** for answer<br><br>1 0 1 1 0 0 0 0<br>+ 0 0 0 1 1 0 1 1<br>1 1 0 0 1 0 1 1<br>1 1 | **2** |
| 3(d)(vi) | 00011001 | **1** |

| Question | Answer | Marks |
|---|---|---|
| 4(a)(i) | **1 mark** each to **max 2**<br><br>• Stores the bootstrap program // start-up instructions **for the central computer** // BIOS<br>• Stores the start-up instructions for the CCTV system/cameras // firmware for CCTV<br>• Stores the kernel of the Operating System // stores parts of the Operating System | **2** |
| 4(a)(ii) | **1 mark** each to **max 2**<br><br>• Costs less per unit<br>• Higher storage density<br>• Simple design – uses fewer transistors | **2** |
| 4(b) | **1 mark** for reason, **1mark** for application/justification<br><br>• The computer will have a large number of read/write operations because it is working all the time<br>• .. magnetic storage has more longevity<br>• Magnetic storage costs less per **storage unit**<br>• … videos are large files and therefore very large storage capacity is required | **4** |
| 4(c) | **1 mark** each to **max 3**<br><br>Examples:<br>• Uses image recognition<br>• Monitors every image taken to identify matching images/shapes/features to a 'person' …<br>• … starts recording to secondary storage/permanently when a person is identified<br>• System identifies direction of movement of person and uses this to decide where/how to move the camera/record<br>• System identifies other cameras to start recording based on direction of movement | **3** |
| 4(d)(i) | **1 mark** for each term<br><br>An IPv4 address contains **4** groups of digits. Each group is represented in **8** bits and the groups are separated by full stops.<br><br>An IPv6 address contains **8** groups of digits. Each group is represented in **16** bits. Multiple groups that only contain zeros can be replaced with a **:: // double colon**. | **5** |

| Question | Answer | Marks |
|---|---|---|
| 4(d)(ii) | **1 mark** for identification, **1mark** for expansion<br><br>e.g.<br>• Reduce amount of traffic in a network // improve network speed<br>• Data stays in its subnet so it does not travel as far<br>• Improves network security<br>• .. so that not all devices can access all areas of the network<br>• Allows for easier maintenance<br>• … because only one subnetwork may need taking down/changing while the rest of the network can continue | **4** |

| Question | Answer | Marks |
|---|---|---|
| 5(a) | **1 mark** for 2 gates<br>**2 marks** for all 4 gates<br><br>  | **2** |
| 5(b) | **1 mark** each<br><br>NAND<br>0 is **only** output when both inputs are 1 // 1 is **only** output when none, or (either) one of the inputs is 1<br><br>NOR<br>1 is **only** output when both inputs are 0 // 0 is **only** output when (either) one or both inputs are 1 | **2** |

| Question | Answer | Marks |
|---|---|---|
| 6 | **1 mark** each to **max 5**<br><br>• An interrupt flag is raised in the (interrupt) register<br>• At the end of the current FE cycle // at the start of the next FE cycle<br>• The system checks the interrupt register for higher priority interrupts than current process<br>• If true, it stores the current contents of the registers on the stack<br>• The appropriate interrupt service routine (ISR) for the key press is called<br>• The input data from the keyboard is processed<br>• The contents of the registers are restored from the stack<br>• ... and control is passed back to previous process | **5** |