CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/11**

Paper 1 Theory Fundamentals **October/November 2024**

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 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

© Cambridge University Press & Assessment 2024

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 descriptions 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).

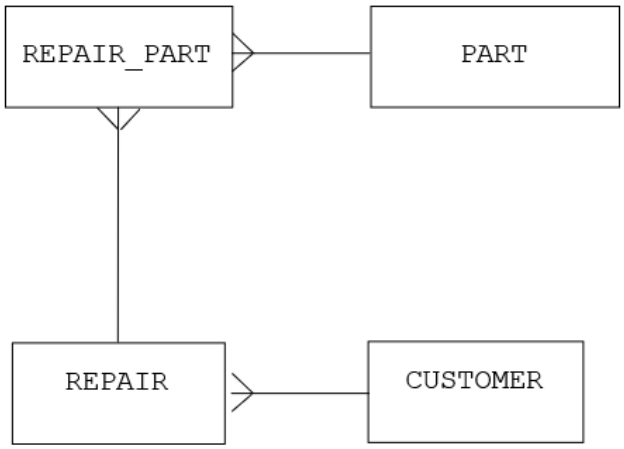
GENERIC MARKING PRINCIPLE 6:

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.

© Cambridge University Press & Assessment 2024

Question	Answer	Marks
1(a)	**1 mark** for: • A tebibyte = 1024 gibibytes / 1 048 576 kibibytes / 2^{40} bytes whereas a gigabyte = 1000 megabytes / 1 000 000 kilobytes / 10^9 bytes • Tebi is binary prefix giga is denary prefix	**1**
1(b)(i)	**1 mark** for: C67	**1**
1(b)(ii)	**1 mark** for: −1641	**1**
1(b)(iii)	**1 mark** for: 573	**1**
1(c)	**1 mark** for working **1 mark** for answer. Working Using the two's complement and adding: 23 in binary = 00010111 so minus 23 is 11101001 0100 1010 + 1110 1001 (1)0011 0011 Direct subtraction: 0100 1010 – 0001 0111 0011 0011 Answer: 0011 0011	**2**
1(d)	**1 mark** from: • The answer cannot be represented in the number of bits available • The answer is larger than the maximum positive number that can be stored in the register • The answer is smaller than the most negative number that can be stored in the register	**1**

© Cambridge University Press & Assessment 2024

Question	Answer	Marks
2(a)	**1 mark** for limitation and **2 marks** for corresponding explanation e.g. Data redundancy // data duplication • Separate linked tables are used • Data items are stored once so reduces data duplication / data redundancy Data inconsistency / Poor data integrity • Data changed once in one place will automatically update elsewhere • Linked data cannot be entered differently in two tables • Referential integrity can be enforced The data structure used depends on the application • Changes to the data structure are managed by the DBMS • … and queries are not dependent on the structure of the data • … and changes to the data do not require programs to be re-written	**3**
2(b)(i)	**1 mark** for each correct relation  	**3**

2(b)(ii)	**1 mark** for each bullet point
	
	• Create table `REPAIR_PART` with opening and closing brackets, all statements inside the brackets
	• `PartID` and `RepairNumber` as varchar (or equivalent)
	• `Quantity` as integer
	• At least 1 appropriate constraint
	• Dual primary key
	
	For example:
	`CREATE TABLE REPAIR_PART(`
	`  PartID VARCHAR(20) NOT NULL,`
	`  RepairNumber VARCHAR(4) NOT NULL,`
	`  Quantity INT NOT NULL,`
	`  PRIMARY KEY (PartID, RepairNumber)`
	`);`
		5

© Cambridge University Press & Assessment 2024

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)(iii)</td><td>1 mark for each bullet point

• Select SUM of <code>AmountDue</code>
• From the correct table and one correct condition
• Second correct condition

<pre>SELECT SUM(AmountDue)
FROM INVOICE
WHERE SupplierID = "JK675" AND Paid = FALSE;</pre></td><td>3</td></tr>
<tr><td>2(c)</td><td>1 mark for each correct definition

<table><tr><th>Database Term</th><th>Definition</th></tr><tr><td>Referential Integrity</td><td>All duplicate entries of data between tables are consistent // all foreign keys are matched to an appropriate primary key</td></tr><tr><td>Candidate Key</td><td>A field that could be a primary key but is not // an attribute or smallest set of attributes in a table where no tuple has the same value</td></tr><tr><td>Tuple</td><td>A row / record in a table // one instance of an entity in a table</td></tr></table></td><td>3</td></tr>
</table>

Question	Answer	Marks
3(a)	**1 mark** for system clock and **1 mark** for Control Unit System clock • To synchronise operations • ... by creating and transmitting timing signals on the control bus Control Unit • Sends/receives control signals along control bus • Reads an instruction from the contents of the memory location whose address is stored in PC • Coordinates/synchronises the activity of other components in the CPU • Manages the execution of instructions • Controls communication between the components in the CPU	**2**
3(b)(i)	**1 mark** for the feature, **1 mark** max for the matching reason e.g. Feature: clock speed • Higher clock speed means that more F-E cycles are executed per second // Higher clock speed results in more throughput Feature: bus width • Larger bus width means that more data transferred at the same time	**2**

© Cambridge University Press & Assessment 2024

Question	Answer	Marks
3(b)(ii)	**1 mark** for correct port. **2 marks** for explanation Port: USB / Universal Serial Bus Explanation: • A voltage change occurs when the drive is plugged in • The computer detects this voltage change • The code of the device is transferred to computer • … the OS finds the code of the device in the list of devices • … and loads the appropriate device driver	**3**
3(c)	**1 mark** for each bullet point (**max 2**) e.g. • DRAM requires constant refresh cycles unlike SRAM • DRAM has lower access speed than SRAM	**2**
3(d)(i)	**1 mark** for each bullet point (**max 4**) • The disc is spun at high speed • A laser is shone onto the disc to read / write • … using optical head to move it into position • … it follows the spiral track from the centre outwards • When writing the laser burns pits to represent the data • When reading the laser reflects from pits and lands • The reflection from a pit and a land is different • ... the differences are interpreted as 1 or 0	**4**
3(d)(ii)	**1 mark** for each bullet point (**max 3**) • The computer and optical disc reader/writer send and receive at different speeds • A buffer allows temporary storage of the data • … so that the computer can transfer data to the buffer at the higher speed • ... and is not held up waiting for data to transfer // so the computer can carry on with other tasks • ... so the optical disc reader/writer is not overloaded • … and so that data is transferred to optical disc reader/writer from the buffer at the slower rate	**3**

© Cambridge University Press & Assessment 2024

Question	Answer	Marks
4(a)(i)	**1 mark** for each bullet point (**max 2**) e.g. • Secondary storage space is divided into file allocation units • Space on secondary storage 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 user access // implements access rights //implements password protection // Makes file sharing possible • Controls access to the file by other software • Specifies tasks that can be performed on a file e.g. open, close, delete, copy, create, move, etc • Allows searching for a file	**2**
4(a)(ii)	**1 mark** for each bullet point (**max 2**) • To allow data to be retrieved / restored when lost • To automatically make a duplicate copy of data… • …so the user does not have to remember to backup data • To make regular duplicate copies of data	**2**
4(b)(i)	**1 mark** for each bullet point (**max 3**) e.g. • Less of the teacher's storage space is used • ... so more student work can be stored • Transmission time is reduced • … so the teacher does not have to wait as long for it to arrive • Bandwidth usage is reduced • … so other transmissions are not adversely affected • Less data allowance is used on the teacher's email system	**3**
4(b)(ii)	**1 mark** for each bullet point (**max 3**) • Run-Length Encoding // RLE • Repeated sequences of the same characters are replaced by • ... a single copy of the character • ... and a count of the number of characters	**3**
4(c)	**1 mark** for each bullet point (**max 3**) e.g. • It saves development time for the student • … by using pre-written code • There is less testing to do // the routines are more likely to work correctly • … because they have already been tested and are error-free • It results in a more robust program • Subroutines can be used that they do not have the skill to write • … which enables a more complex program to be written	**3**

© Cambridge University Press & Assessment 2024

Question	Answer	Marks
4(d)(i)	**1 mark** for correct name, **1 mark** for matching description • Expand/collapse code blocks… • … sections of source code that are part of the same block can be expanded to see the content or collapsed so that the overall code is seen • Auto-indentation // auto-formatting... • ... automatically indents/formats code as the user types so that the structure is clear // aids readability	**2**
4(d)(ii)	**1 mark** for correct name, **1 mark** for matching description • Breakpoints … • … stops the code running on a set line to view the current status/variable contents/program flow • Report window // variable watch window … • … shows the values in variables/data structures and how they change when each line is run	**2**

Question	Answer	Marks
5(a)	**1 mark** for all 3 appropriate sensors **Scenario** / **Type of sensor** A door is open. / Pressure sensor // Infra-red The external daylight-level is below a set amount. / Light sensor A person is detected within 2 metres. / Infra-red	**1**
5(b)	**1 mark** for each correct expression X = **E** AND **A** AND **C** Y = **E** AND (**B** OR **C** OR **D**)	**2**
5(c)	**1 mark** for each bullet point (**max 3**) for a correct justification No marks for the identification of the system **Monitoring system** • There is no use of feedback // The light and the alarm are just warnings • The output of the floodlight or the audio alarm does not affect the input of data from the sensors • The system does not have any actuators	**3**

© Cambridge University Press & Assessment 2024

Question	Answer	Marks
6	**1 mark** for each bullet point (**max 4**) e.g. • It uses image recognition • The pixels of each image from the camera are stored • … and matched to the expected shape/size/colour of registration number • It uses optical character recognition • The pixels within the registration number area identified are analysed • … and compared to expected characters/letters/numbers	**4**

Question	Answer	Marks
7(a)	**1 mark** for each bullet point (**max 2**) • The user can test/trial the program before purchasing to see whether it meets needs • There is no initial cost • Users who try the software may spread the word so the developer gets more custom • The developer can get feedback to improve the program	**2**
7(b)	**1 mark** for each bullet point (**max 2**) • The owner/developer can earn a fee • Comprehensive support is usually offered so problems can be easily solved • The software is usually well tested so few bugs	**2**

Question	Answer	Marks
8(a)	**1 mark** for each bullet point (**max 2**) • To store the value of flags/bits • … that can be changed/set/cleared after arithmetic / logical operations • To allow flags to be checked • … to change instruction sequence	**2**
8(b)	**1 mark** for each bullet point (**max 2**) • Special purpose registers have a specified role in the machine whereas general purpose registers can be used for all purposes defined by the programmer • Special purpose registers hold the state of the program's execution while general purpose registers hold the program's data during operations	**2**

© Cambridge University Press & Assessment 2024