Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9608/32**

Paper 3 Advanced Theory **May/June 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 May/June 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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Please note the following further points:

Please also read the additional guidance in the mark scheme, it provides further information about how to mark the question.

Please annotate **every** question on your scripts. The number of ticks given **must** match the number of marks given. If you award a benefit of doubt (BOD) mark, this **must** also have a **tick**.

The sections in brackets in the mark scheme are not necessary in the candidates answer.

The words in **bold** in the mark scheme are important text that needs to be present, or some notion of it needs to be present. It doesn't have to be the exact word, but something close to the meaning.

If a word is underlined, this **exact** word must be present.

A single forward slash means this is an alternative word. A double forward slash means that this is an alternative mark point.

Red text in the mark scheme is a response that we think it just about okay, but that will not be published as a response.

Ellipsis (…) on the end of one mark point and the start of the next means that the candidate **cannot** get the second mark point without being awarded the first one. If a MP has ellipsis at the beginning, but there are no ellipsis on the MP before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

Please inform your team leader when you have submitted your standardisation scripts. They may have many examiners that they are monitoring, so may not see your submission immediately.

The mark scheme has been agreed at standardisation, so it is the AE's responsibility to apply it. You may have differing opinions on how the paper should be marked, but the mark scheme is what has been agreed by a panel and AE's are required to apply it.

Please mark your allocation at a steady rate. If you are not able to mark your allocation for a number of days, inform your team leader, do not wait for them to have to chase you. Please ensure that you meet the 40% deadline. If you are not close to or meeting this at the 40% deadline, some of your allocation may be reallocated. If you are going to struggle with this deadline, you **must** inform your team leader ASAP.

There are **four** blank pages in the exam paper. These **four** pages **must** be annotated with a **SEEN** annotation, to indicate it has been checked for any further responses. Also, any blank responses must have a SEEN annotation, as every question must be annotated. If you do not annotate correctly, you may be stopped by your TL.

If a candidate writes outside the zoned area for the question, this must be linked to the response, even if it is not awarded a mark. This demonstrates at grade review that you did read this part of the response.

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Question	Answer	Marks
1(a)(i)	A mantissa: 0.75 // 3/4 A exponent: −1 B mantissa: −0.25 // –1/4 B exponent: 4	**4**
1(a)(ii)	A: 0.375 // 3/8 B: −4	**2**
1(b)	Number **A** Justification **Using** the mantissa The first two bits are different // first bit 0 second bit 1	**3**

Question	Answer	Marks
2(a)	**One mark** for each correct row	**4**

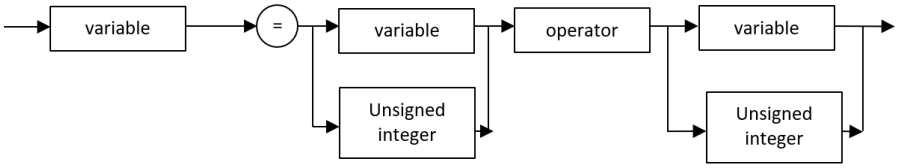
Layer	Description
Application	Handles access to services // manages data exchange // defines protocols used
Transport	Handles packets
Internet // Network	Handles transmission of data
Network Access // Interface // (Data) Link // Physical	Handles how data is physically sent

Question	Answer	Marks
2(b)	**One** mark for identification, **one** mark for purpose Max **four** for two protocols e.g. Protocol: FTP// File Transfer Protocol Purpose: To directly transfer data between two computers over a network Protocol: POP3 //Post Office Protocol 3 // IMAP // Internet Message Access Protocol Purpose: To receive **e-mail** // download **emails** from a server Protocol: SMTP // Simple Mail Transfer Protocol Purpose: To send **e-mail** Protocol: Ethernet Purpose: To send/receive data along a **cable** Protocol: BitTorrent Purpose: used for peer-to-peer file sharing Protocol: HTTP(S)//Hypertext Transfer Protocol (Secure) Purpose: transfer of web pages/hypertext	**4**

Question	Answer	Marks
3(a)	Any **three** from: **Max 2:** • Diagram showing bus topology structure … • … correct labels (e.g. terminator, device/node/workstation, backbone/main cable) **Max 2:** • All nodes connected to a **single cable** … • … with a terminator at each end • Uses half duplex	**3**
3(b)	Any **four** from: • Ethernet operates over cable // Ethernet does not operate over Wi-Fi • Destination and source nodes are identified by MAC addresses • Data to be transmitted is divided into frames … • … containing, e.g. source and destination addresses/data/error checking data • All data is transmitted over the same cable • Using CSMA/CD	**4**

Question	Answer	Marks
4(a)(i)	**One** mark for 2 correct terms **or two** marks for 4 correct terms and no other terms $X = \overline{P}.\overline{Q}.\overline{R}.\overline{S} + \overline{P}.Q.\overline{R}.\overline{S} + P.\overline{Q}.R.S + P.Q.R.S$	**2**
4(a)(ii)	**Two marks** for fully correct K-map **One mark** for a K-map with one error **Zero marks for a** K-map **with two or more errors** **PQ** **RS** 00: 1 1 0 0 01: 0 0 0 0 11: 0 0 1 1 10: 0 0 0 0	**2**
4(a)(iii)	**One** mark for each correct loop **max 2** **PQ** **RS** 00: 1 1 0 0 01: 0 0 0 0 11: 0 0 1 1 10: 0 0 0 0	**2**
4(a)(iv)	**One** mark per point • $\overline{P}\overline{R}.\overline{S}$ • $+P.R.S$ $X = \overline{P}\overline{R}.\overline{S} + P.R.S$	**2**
4(b)	**One** mark for correct use of distributive law **One** mark for correct use of complementary law **One** mark for correct use of redundancy law **Max two** e.g. $X = \overline{P}.\overline{Q}.\overline{R}.\overline{S} + \overline{P}.Q.\overline{R}.\overline{S} + P.\overline{Q}.R.S + P.Q.R.S$ $X = \overline{P}.\overline{R}.\overline{S}(\overline{Q} + Q) + P.R.S(\overline{Q} + Q)$ $X = \overline{P}\overline{R}.\overline{S} + P.R.S$ // $\overline{P}.\overline{R}.\overline{S}(1) + P.R.S(1)$	**2**

Question	Answer	Marks
5(a)	**One mark** per bullet point to **max 3** • Circuit / electronic components (construction) • With **two states** • Used for data storage elements // memory • …to store 1 bit of data	**3**
5(b)	**One mark** per bullet point to **max 2** • SR flip-flop has undefined / invalid / indeterminate state // JK flip-flop is stable • Description of undefined / invalid / indeterminate state for SR // Description of why JK flip flop is stable • JK flip flop has a clock pulse	**2**

Question	Answer	Marks
6(a)	• `Y` is not a variable • `:=` should be `=` for an assignment statement • `7` is not a valid digit	**3**
6(b)	`<assignment_statement> ::= <variable> = <variable>` 1 `<operator> <unsigned_integer>` 1 `<variable> ::= <letter> <digit>` 1 `<unsigned_integer> ::= <digit> | <digit><digit>` 1 `<operator> ::= + | - | *` `<digit>::= 1 | 2 | 3` 1	**5**
6(c)(i)	assignment statement  Syntax diagram shows variable and unsigned integer in correct places 1 with **correct** arrows throughout 1	**2**

6(c)(ii)	**Two** marks fully correct
	Or
	One mark `<assignment statement>::=` **and** any 2 correct alternatives
	Or
	One mark missing `<assignment statement> ::=` **and** rest correct
	
	`<assignment statement> ::=`
	`<variable> = <variable><operator><variable>`
	`|<variable> = <unsigned integer><operator><variable>`
	`|<variable> = <variable><operator><unsigned integer>`
	`|<variable> = <unsigned integer><operator>`
	`<unsigned integer>`
		2

Question	Answer	Marks
7(a)	Public **Certificate** Authority // CA Encrypt (Message) Digest Private	**5**
7(b)	Any **two** from: • TLS // Transport Layer Security • SSL// Secure Socket Layer • HTTPS	**2**
7(c)	**One** mark method, **one** mark description Any **two** from: e.g. Use of firewall (1) to enforce rules for downloading data (1) Use of antivirus software (1) to quarantine viruses(1) Not clicking on links in emails from unknown source (1) to redirection to a bogus website (1)	**4**

Question	Answer	Marks
8(a)(i)	Control (system)	**1**
8(a)(ii)	Any **two** from: • **Automatically controls** devices / heaters / vents • … using actuators • With the use of feedback // output affects the values that are input • To maintain the required temperature range	**2**
8(b)	(Greenhouse) 2: 23 degrees (Greenhouse) 4: –1 degree	**2**
8(c)	700 | **1** | **1** | **0** | **0** | **0** | **0** | **0** | **0** |	**1**

8(d)(i)	**One mark** each from:
	• Load the accumulator with status of heaters and vents //
	Load the accumulator with the contents of address 700
	• Mask out the bits for greenhouse 1
	// Mask out 4th and 8th bit
	• See whether both heater is on and vent is open //
	Compare the contents of the accumulator/previous result with 10001000 / (&88)
	• IF the heater is on and the vent is open go / jump to ERROR routine
	// go / jump to ERROR routine if bit patterns are equal
		4

Question	Answer	Marks

8(d)(ii)	**One mark** keeping instructions 1 and 4 the same
	One mark `AND &44` as second instruction
	One mark `CMP &44` as third instruction
	`LDD 700`
	`AND &44 // AND B01000100`
	`CMP &44 // CMP B01000100`
	`JPE ERROR`
		3