GCE A LEVEL MARKING SCHEME

AUTUMN 2021

A LEVEL
COMPUTER SCIENCE - COMPONENT 2
A500U20-1

INTRODUCTION

This marking scheme was used by WJEC for the 2021 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

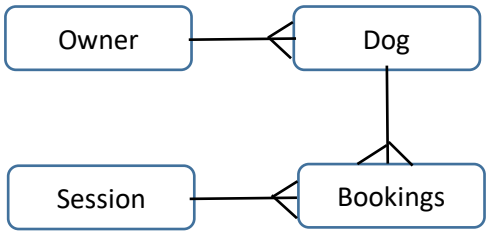
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

EDUQAS GCE A LEVEL COMPUTER SCIENCE – COMPONENT 2

AUTUMN 2021 MARK SCHEME

Question	Answer	Mark	AO1	AO2	AO3	Total
1.	Multi-tasking **1 mark** for each point, up to a maximum of **2 marks**: • A method of organising computer use that allows several tasks or applications to be available at the same time. • The operating system will allow users to have several tasks apparently running at the same time, with the user switching freely between tasks or applications. • Concept of time sharing - The switching occurs when the time slice of currently executing process ends. Multi-programming. **1 mark** for each point, up to a maximum of **2 marks**: • A multi-programming operating system allows multiple processes to reside in main memory where only one program is running. • The aim is to optimise CPU use by reducing CPU idle time. • Concept of context switching - The switching is done when the currently executing process halts, such as when waiting for I/O, and the CPU is allocated to some other process.	4	1b			4

Question	Answer	Mark	AO1	AO2	AO3	Total
2. (a)	**1 mark** for each correct one to many relationships.  	3		2b		9
(b)	**1 mark** for **Primary** key in both Owner and Session tables. **1 mark** for each **Foreign key** field, appropriately identified in Dog and Booking tables to a maximum of **3 marks** **Indicative content:** Owner (OwnerID **[P]**, Name, HouseNo, Postcode) Dog (DogID **[P]**, OwnerID **[F]**, Name, Breed, ChipNo) Booking (BookingID **[P]**, SessionID **[F]**, DogID**[F]**) Session (SessionID **[P]**, SessionCost, SessionDate, SessionTime) Ignore additional fields	4		2b		
(c)	**1 mark** for naming advantage**, 1 mark** for relevant expansion to a maximum of **2 marks** • **Removing Data duplication** 3rd normal form removes duplicated data reducing the size of the stored file. • **Protecting Data integrity** Once redundant data is removed, it is easy to change the data since data is present in only one place. OR Reduction of duplicated data decreases the risk of updating some rather than all instances of an item of data.	1 1 1	1b 1b 1b			

Question	Answer	Mark	AO1	AO2	AO3	Total
3. (a)	**1 mark** for each identified register and **1 mark** for each correct expansion to a maximum of **6 marks** • Program Counter (PC) - an incrementing counter that keeps track of the memory address of the next instruction to be executed • Memory Address Register (MAR) - holds the address in memory of the next instruction to be executed or the address to which data will be sent and stored. • Current Instruction register (CIR) – is a temporary holding register for the instruction that has been fetched from memory and is being executed • Memory Data Register (MDR) - this holds data that is being transferred to or from RAM. • Accumulators - short-term, intermediate storage of arithmetic and logic data • Status Register- contains information about the state of the processor and are used to test for various conditions in an operation, such as 'is the result negative', 'is the result zero.	6	1b			12
(b)	**Indicative content** loop INP {input value to be validated} STA num1 {Store entered number} LDA num1 {Load stored number in accumulator} SUB validate {Subtract 100 from accumulator} JZG label1 {Jump to label1 if the result is zero or positive} JMP loop {loop} label1 LDA num1 {load original number} OUT {output result} HLT {end of program} validate DAT 100 num1 DAT **1 mark** for input of number **1 mark** for: label1 and JZG command creating a loop **1 mark** for: subtracting validation value from input **1 mark** for output of original number if invalid	4			3b	
(c)	**1 mark** – change JZG to JNG / use of JNG **1 mark** – change 100 to 50 / use of DAT 50	2			3b	

Question	Answer	Mark	AO1	AO2	AO3	Total

4. (a)	**Indicative content**
	
	`CREATE TABLE Order`
	`(`
	`bookingNo char(7) NOT NULL,`
	`schoolCode char(3) NOT NULL,`
	`bookingDate datetime,`
	`trainingDate datetime,`
	`delegates int,`
	`cost numeric (4,2),`
	`PRIMARY KEY (bookingNo)`
	`);`
	Or, as above
	`CREATE TABLE Order`
	`(`
	`bookingNo char(7) NOT NULL`
	`PRIMARY KEY…`
	
	1 mark for each of the following:
	• Correct construct (CREATE TABLE with brackets in correct places)
	• Identifying PRIMARY KEY
	• NOT NULL on key field
	Numeric(x,2), 2 has to be present x can be any sensible number representing pounds
		
		1
		
		1
		1
		1
					3b	10

(b) (i)	**Indicative content**
	
	`SELECT schoolName, telephoneNo`
	`FROM School ORDER BY postcode;`
	
	1 mark for each of the following;
	`SELECT` correct data
	`ORDER BY postcode`
	
	Accept: `ORDER BY ASC`
		
		1
		1
					3b	

(ii)	**Indicative content**
	
	`SELECT bookingNumber, schoolCode, trainingDate, delegates FROM Booking`
	`WHERE ((trainingDate) Between "01/02/2022" And "30/04/2022") AND ((delegates)>=7));`
	
	1 mark for each of the following;
	Correct selection and source
	Criteria - `Between` and `AND`, correct dates and `>=7`
		
		1
		1
					3b	

Question	Answer	Mark	AO1	AO2	AO3	Total
(iii)	**Indicative content** `SELECT schoolCode, postCode FROM School WHERE schoolCode = (SELECT schoolCode FROM Booking WHERE trainingDate <20/04/2022);` **1 mark** for each of the following; `SELECT schoolCode FROM Booking WHERE` correct criteria	 1 1			 3b	

Question	Answer	Mark	AO1	AO2	AO3	Total
5. (a)	**1 mark** for each correct statement to a maximum of **4 marks**. • Processes must be allocated an exclusive area of main memory. An allocated area of memory cannot be used by a second process until the first process is complete and de-allocated from memory. • Fixed partitioning is the system of dividing memory into non-overlapping sizes that are fixed. A process may be loaded into a partition of equal or greater size and is confined to its allocated partition. • Small processes with respect to the fixed partition sizes results in occupied partitions with lots of unoccupied space left. This unoccupied space is known as internal fragmentation. • Variable partitioning is a system for dividing memory into non-overlapping but variable sizes. More flexible than the fixed partitioning configuration, where small processes are allocated to small partitions and large processes allocated to larger partitions. • Dynamic partitioning. Partitions are made during run-time according to process's need instead of partitioning during system configuration. The partition size varies according to the need of the process so that internal fragmentation can be avoided to ensure efficient utilisation of RAM.	4	1b			8
(b)	**1 mark** for description, and **1 mark** for suitable expansion. • Memory buffering - the temporary storage in memory of information / processes that are waiting to be executed / processed - whilst other information / process is being processed / executed.	2	1b			
	1 mark for purpose, and **1 mark** for suitable example. • Double buffering - The use of two buffers increases the throughput of a device and helps prevents bottlenecks.	1	1b			
	Indicative example Graphics, double buffering can be used to show one image or frame while a separate frame is being buffered to be shown next.	1	1b			

Question	Answer	Mark	AO1	AO2	AO3	Total
6.	**1 mark** for correct statement, **1 mark** for associated explanation to a maximum of **6 marks**. **Indicative content** • Data mining – Is the process of analysing a large batch of information to discern trends; by identifying patterns and connections in data based on what information users request or provide. • Predictive analytics is a way to predict future events based on past behaviour. It's a combination of statistics and data mining • Statistical and data mining tools are applied to large data sets: to build models to predict what might happen in the future. • Predictive analytics assigns a probability (predictive score) for the likelihood that something such as a customer, will behave a certain way. It is used to predict behaviour and assess risk over a wide variety of disciplines.	2 2 2 2	1b 1b 1b 1b			6

Question	Answer	Mark	AO1	AO2	AO3	Total
7. (a)	**1 mark** for each correct value N | P = 0.5 | P = 0.9 10 | 1.82 | 5.26 1000 | 1.99 | 9.91 100000 | 1.99 | 9.99	2		2b		6
(b)	**1 mark** for correct statement, **1 mark** for associated explanation to a maximum of **4 marks**. • The calculations indicate that at 50 % parallel processing there is no significant benefit in increasing the number of processors above 10; as the 50 % serial fraction is significant and limits the potential of parallelisation. • At 90% parallel processing the benefits are much greater, but there is only a small benefit in increasing the number of processors above 1000; This is marginal and likely to be outweighed by practical issues. • The level of parallelisation achieved in the software is more significant than the number of processors used.	2 2 1		2b 2b 2b		

Question	Answer	Mark	AO1	AO2	AO3	Total
8. (a)	**1 mark** for identifying purpose and **1 mark** for description to a maximum of **2 marks**. • To run specialised graphics software able to carry out the geometric calculations necessary to produce accurate 2D and 3D screen representations / models; that can be viewed and manipulated from all angles. • To improve the efficiency / productivity of the design process; by enabling early visualisation of design proposals, improve record keeping through better documentation and version control and promote team working through better communications.	2 2	1b 1b			**6**
(b)	**1 mark** for identifying a suitable use and **1 mark** for description to a maximum of **4 marks**. **Indicative content** • A medical animation - a short educational film, usually based around a physiological or surgical topic, rendered using 3D computer graphics and most commonly used as an instructional tool for medical professionals or their patients. • Education and training. A popular tool in classroom teaching and learning and in work related training. Use of animation can increase interest & motivation in learning. • Forensic animation - The use of computer animation, stills, and other audio visual aids to recreate incidents to aid investigators and help solve cases.	2 2 2	1b 1b 1b			

Question	Answer	Mark	AO1	AO2	AO3	Total
9.	**1 mark** for each characteristic described to a maximum of **3 marks** for each application. Email. • A method of exchanging digital messages from the advertising agency to one or more recipients using the Internet. • Based on a store-and-forward model. • Neither the end users (clients) nor their computers are required to be online simultaneously • Users need connect only briefly, typically to the agency's email server, for as long as it takes to send or receive messages. Internet forum. • An advertising agency online discussion site where clients and employees hold conversations in the form of posted messages. The messages are at least temporarily archived. • A posted message might need to be approved by an advertising agency moderator before it becomes visible. • A forum is hierarchical in structure: a forum can contain a number of subforums e.g. advertising, each of which may have several topics. • Within an agency's forum's topic, each new discussion started is called a thread, and can be replied to by as many people as wish to. VoIP • Voice over Internet Protocol is a type of internet telephony in which the Internet is used to make phone calls or send messages. • Messages are either one on one or for audio-conferencing. • VOIP programs allow employees and clients to make voice and video calls. • Converting analogue voice signals to digital for transmission through the network, and then back to analogue, is accomplished by a codec.	1 1 1 1 1 1 1 1 1 1 1 1		2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b		9

Question	Answer	Mark	AO1	AO2	AO3	Total
10. (a) (i)	**1 mark** for each stage to a maximum of **4 marks** -16_{16} ->11101010_2 $1A_{16}$ -> 00011010_2 00011010_2 11101010_2 00000100_2. 1 mark addition 111110100 1 mark carry	 1 1 1 1		 2b 2b 2b 2b		**13**
(a) (ii)	**1 mark** for each stage to a maximum of **3 marks** Exponent = 0101_2 = +5 Move binary point = 011010.11 Denary value = 26.75	 1 1 1		 2b 2b 2b		
(a) (iii)	**1 mark** for each stage to a maximum of **3 marks** Binary representation = 100101.101_2 Normalised mantissa = 0.10010110100 Exponent = 0110_2	 1 1 1		 2b 2b 2b		
(b)	**1 mark** for each relevant point to a maximum of **2 marks** and **1 mark** for suitable example **Indicative content** • Integers can be represented accurately but only within the range provided by the number of bits allocated to mantissa and exponent. • Decimal or fractional parts of base 10 numbers cannot always be represented exactly as binary fractions, • Where values cannot be represented the stored value will be truncated and therefore inaccurate. • e.g. 0.5 (1/2) can be represented as 2^{-1} whereas 0.3 (or any other correct example) falls between base 2 fractional values and cannot be represented exactly.	 1 1 1 1	 1b 1b 1b 1b			

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th></tr>
<tr><td>11. (a)</td><td>1 mark for each correct upload time and 1 mark for each overhead time to a maximum of 6 marks

<table><tr><th></th><th>Upload (Mbps)</th><th>Overhead/ file (s)</th><th>Total hours</th></tr><tr><td>Provider 1</td><td>22.2 hrs</td><td>27.7 hrs</td><td>49.9</td></tr><tr><td>Provider 2</td><td>33.3 hrs</td><td>20.8 hrs</td><td>54.1</td></tr><tr><td>Provider 3</td><td>16.6 hrs</td><td>34.7 hrs</td><td>51.3</td></tr></table></td><td>6</td><td></td><td>2b</td><td></td><td rowspan="2">8</td></tr>
<tr><td>(b)</td><td>1 mark for reason and 1 mark for justification to a maximum of 2 marks
Select provider 1 because, whilst the upload times are similar the download speed is significantly faster. This is likely to have a greater effect on daily use.

OR

Select provider 3 because, whilst the upload times are similar the overhead arising from encryption is greater. Indicating that the system is more secure against unauthorised access.</td><td>1

1

1

1</td><td></td><td>2b

2b

2b

2b</td><td></td></tr>
</table>

Question	Answer	Mark	AO1	AO2	AO3	Total
12.	**1 mark** up to a total of **9 marks** awarded by application of mark bands **Indicative content:** **Implications on individuals.** • Email accounts, social media sites, and other personal information have been compromised. • Cyber-attacks affect personal data and privacy, as well political, economic, and social systems. • The implications for the average person range from identity theft to financial losses to reputational damage resulting from non-consensual data broadcasts. • Many cyber-attacks are extremely personal. Hacked emails, social accounts, webcams, and mobile phones provide some of the numerous attack vectors for domestic assailants. • Due in large part to the proliferation and accessibility of digital weapons, spyware and other surveillance tools can be implanted, and have been used in cases ranging from cyber bullying to domestic abuse. **Implications on society.** • On domestic and international politics, integrating cyber-attacks with data that contain a mixture of real and false information to influence public opinion / election results. • Theft of business patents and processes cause detrimental impacts on businesses, with measurable financial and productivity implications. • Usernames, passwords, credit card data, health records – malicious use of this data by criminals can result in the organisations the data was stolen from suffering from loss of reputation, fines, falling sales, and legal proceedings. • Hackers gaining access to everyday public and utility services in order to cause havoc and disrupt society constitutes a genuine threat to UK national and infrastructure security. • Hackers gaining access national security and military systems to cause havoc and hold nations to ransom.	9	1b			9

Question	Answer	Mark	AO1	AO2	AO3	Total
	Security measures • Turn on firewalls, use anti-virus / anti-malware software • Password rules. Strong passwords are one of the first lines of defence. Make regular password updates mandatory and use strong passwords. • Update regularly. Any connection to the Internet is vulnerable. Keep every connection, operating system, and application up to date with patches and enhancements. • Implement VPNs for all connections. Networks that are protected only by generic security measures are more vulnerable to attack. Implement virtual private network (VPN) connections and make their use easy and mandatory when using public Wi-Fi services. • Retire unused services When systems are no longer needed, delete the applications, logins, and user credentials associated with them. Turn off unused software features such as a video chat function to limit potential for unauthorised access.					

Band	Q15 Max 9 marks
3	**7–9 marks** **The candidate has:** • written an extended response that has a sustained line of reasoning which is coherent, relevant, and logically structured • shown clear understanding of the requirements of the question and a clear knowledge of the topics as specified in the indicative content. • addressed the question appropriately with minimal repetition and no irrelevant material • has presented a balanced response and justified their answer with examples • effectively drawn together different areas of knowledge, skills and understanding from all relevant areas across the course of study • used appropriate technical terminology confidently and accurately.
2	**4–6 marks** **The candidate has:** • written a response that has an adequate line of reasoning with elements of coherence, relevance, and logical structure • shown adequate understanding of the requirements of the question and a satisfactory knowledge of the topics as specified in the indicative content. • presented a response with limited examples • drawn together different areas of knowledge, skills and understanding from a number of areas across the course of study • used appropriate technical terminology.
1	**1–3 marks** **The candidate has:** • written a response that that lacks sufficient reasoning and structure • produced a response which is not well developed • attempted to address the question but has demonstrated superficial knowledge of the topics specified in the indicative content • used limited technical terminology.
0	Response is not credit worthy or not attempted.