GCE A LEVEL MARKING SCHEME

AUTUMN 2020

A LEVEL
COMPUTER SCIENCE - COMPONENT 2
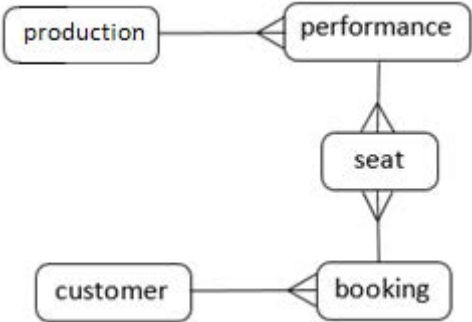**A500U20-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2020 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.

GCE A LEVEL COMPUTER SCIENCE

AUTUMN 2020 MARK SCHEME

Question		Mark	AO1	AO2	AO3	Total
1. (a)	**1 mark** for each point, up to a maximum of **4 marks**: • The master file/stock file would be updated as purchased items are processed/scanned at the checkouts. • Deliveries of goods received from suppliers/central warehouse would be added to the master file/stock file in real time/as they are received. • Quantities in stock would be compared with a specified minimum quantity each time a purchase is recorded, and items below this stock level would be listed for reordering. • Items below the stock level will be added to the re-order file which will be updated as transactions take place.	4		2a		4
(b)	**1 mark for identification of the problem and 2 marks for description of the solution.** • The potential for data integrity to be compromised. • When one terminal is updating a record, the record will be locked to prevent any other device making changes. • Further changes to a record will be held in a queue/buffer and processed when the previous update is completed.	3		2a		3

Question		Mark	AO1	AO2	AO3	Total
2. (i)	**1 mark** for each correct 1: many relationships:	4		2b		8
(ii)	**1 mark** for 2 suitable key fields, **2 marks** for 4 suitable key fields. Accept compound key fields. **1 mark** for each foreign key field, up to a maximum of **4 marks.** PRODUCTION (prodID **[P]**, prodName, prodDescription, ….) PERFORMANCE (performanceID **[P]**, [prodID **[F]**, date, time, …) SEAT (seatID **[P]**, performanceID **[F]**, bookingID **[F]**, row, seatNumber, …) BOOKING (bookingID **[P]**, customerID **[F]**, bookingDate, amountPaid, ….) CUSTOMER (customerID **[P]**, surname, forename, …)	4		2b		

Question		Mark	AO1	AO2	AO3	Total
3.	**Indicative content:**	6			3b	6

	start IN {input temperature}
	         SUB 65 {subtract required temperature}
	         JPOS high {if result is positive, temperature is too high}:
	
	         OUT 0 {output code to deactivate warning light}
	         JMP start {return to start of loop}
	high OUT 1 {output code to activate warning light}
	         JMP start {return to start of loop}
	
	1 mark for input of temperature
	1 mark for label and JMP command creating a loop
	1 mark for subtracting required temperature from input
	1 mark for output value 0 if temperature acceptable
	1 mark for output value 1 if temperature too high
	1 mark for correct repetition of loop in all cases					

Question		Mark	AO1	AO2	AO3	Total
4. (a)	SELECT Name, Address FROM MEMBER (1) WHERE MemberClass='Senior' (1)	2			3b	10
(b)	SELECT MemberID FROM RESULT (1) WHERE Minutes < 17 (1) Note: SQL requires single quotes around text fields. However, do not accept quotes around numeric values.	2			3b	
(c)	SELECT Name from MEMBER WHERE MemberID = (SELECT MemberID FROM RESULT WHERE Date='15 Apr 20') **1 mark** for: SELECT Name from MEMBER WHERE MemberID =(…) **1 mark** for: SELECT MemberID FROM RESULT WHERE Date='15 Apr 20' Accept but not expect a solution using JOIN: SELECT Name FROM (MEMBER JOIN RESULT ON MemberID) WHERE Date='15 Apr 20' **1 mark** for: SELECT Name FROM (MEMBER JOIN RESULT.) **1 mark** for: WHERE Date='15 Apr 20'	2			3b	
(d)	INSERT INTO RESULT VALUES (106, '15 Apr 20',17,20) **1 mark** for: INSERT INTO RESULT **1 mark** for: VALUES (106,'15 Apr 20',17,20)	2			3b	

Question		Mark	AO1	AO2	AO3	Total
(e)	CREATE TABLE PAYMENT (PaymentID Integer PRIMARY KEY MemberID Integer PaymentDue Double Paid Boolean) Maximum of **2 marks** can be awarded. **1 mark** for: CREATE TABLE PAYMENT **1 mark** for four suitable field types. Accept any valid decimal number format for PaymentDue field. **1 mark** for setting PaymentID as PRIMARY KEY.	2			3b	

Question		Mark	AO1	AO2	AO3	Total
5. (a) (i)	Link costs: AC 40 BC 10 CD 2 DE 100 DF 5 EF 4 Maximum of **2 marks**. Award **1 mark** for each three correct answers.	2		2a		5
(ii)	Route: A -> B -> C -> D -> F	1		2a		
(b)	Maximum of **2 marks**. **1 mark** for each point: • In computer networks, multiplexing is needed to combine multiple digital signals into one signal (1) so the multiple messages can be transmitted along a single data link / channel at the same time. (1)	2	1a			

Question		Mark	AO1	AO2	AO3	Total
6. (a) (i)	**1 mark** for description and **1 mark** for example, • Parallel transmission is the sending of each bit of a byte of data at the same time along separate channels • Parallel transmission is very fast, and is used when a large amount of data is being sent / when data needs to be sent quickly (1) Examples • communication between components on the motherboard of a computer. (1) • Video streaming (1)	2	1b			10
(ii)	**1 mark** for each point, up to a maximum of **2 marks**: • Serial transmission involves sending a series of bits one after another along a single communication channel. Serial transmission operates reliably over long distances Example Network communications (1)	2	1b			
(b) (i)	**1 mark** for each point, up to a maximum of **4 marks**: • Bus networks are bi-directional. • Messages might be transmitted simultaneously from two computers and come into collision. • Computers will detect that a collision has occurred due to the interference pattern produced. • All computers stop transmitting, then wait for a random time interval before attempting to retransmit.	4	1b			
(ii)	**1 mark** for each point, up to a maximum of **2 marks**: • Ring networks operate in a single direction. • Token ring networks carry a single circulating token, to which a message must be attached for transmission. Only one message can be transmitted at a time. • Larger ring networks are divided into sectors, separated by nodes. Only one message may be present in each sector. Messages will not be transmitted onwards until the next sector is clear.	2	1b			

Question		Mark	AO1	AO2	AO3	Total
7. (a)	**1 mark** for: 231.625 = 1110 0111.101 **1 mark** for any valid expression displaying a mantissa and power of 2, e.g.: 0.1110 0111 101 x 2^8 **2 marks** for correct floating point representation (1 mark for mantissa, 1 mark for exponent) using the correct number of bits: 0111 0011 1101 0000 1000 Accept: mantissa = 0.111 0011 1101 exponent = 0000 1000	4		2a		6
(b)	More bits allocated to the mantissa the greater the accuracy (1) the greater the number of bits allocated to the exponent the larger the range (1) but with loss of accuracy.	2		2a		
8. (a)	**1 mark** for each point, up to a total of **2 marks**: • Many frames are required to produce a short section of film. • Each frame requires many calculations to generate the graphics – a justification is needed, e.g. calculating positions of moving/rotating objects, calculating positions of shadows. • Realistic textures must be applied to surfaces, e.g. hair, fabric, metal, water.	2	1b			4
(b)	10% of the algorithm must be carried out serially: 10% of 20 minutes = **2 minutes** 90% can be run in parallel: 90% of 20 minutes = 18 minutes This time is shared between 6 processors, so parallel running time = 18/6 = **3 minutes** Total run time = **5 minutes** (Use of a formula in the calculation is equally acceptable)	1 1		2b 2b		

Question		Mark	AO1	AO2	AO3	Total
9.	Inputs: • Updated meter reading • New customer / amended customer details	2	1b			8
	Processes: • Sorting of transaction file in key field order to match master file. • Merging of data to update master file • Calculation of electricity used and cost	3	1b			
	Outputs: • Updated master file • Customer bills • Error log	3	1b			
10. (a)	Correct result is 220	1		2b		6
(b)	**One mark for each point up to a maximum of 3 marks** • Only 10 out of a 1000 memory locations will be accessed • Product codes will hash to only a few locations so many collisions will be expected. • Collisions will result in overflow locating a record in overflow will involve slow serial access. • Will only work up to year 99 before duplicating the year.	3		2b		
(c)	Up to a maximum of **2 marks** for describing an improved hashing algorithm which would spread the data and reduce collisions, **Indicative content** • Delete the last 2 digits '20' and carry out MOD 1000 on the remaining 5 digits. • Change the hash function to: keyfield DIV 10 000 so the location is determined by only the first three digits of the product code. • Modify the hash function so that 20 is not a factor of the modulus, e.g. key field MOD 999	2		2b		

Question		Mark	AO1	AO2	AO3	Total
11. (a)	**1 mark** for each point, up to a maximum of **4 marks**: • Single key encryption can be faster in use. Double key encryption takes longer to encrypt a document, and longer to decrypt, due to the large amount of calculations involved. • It can be faster to set up a single key encryption system than a double key system, as the programming involved may be simpler. • Single key encryption may not be secure if the key value has to be transferred over the internet and is intercepted by an unauthorised person. • Double key encryption avoids the security risk by only revealing the public encryption key to the sender. The private decryption key is held securely by the receiver and not revealed.	4	1b			12
	1 mark for each valid example application, **1 mark** for explanation • Single key encryption suitable for personal use in encrypting files on a single computer. No transfer of the key value to another user needed. • Single key encryption is suitable for use within an office or work group, where the key value can be transferred during personal meetings or over a secure local area network. • Double key encryption is more suitable for transfer of confidential data over the internet (such as credit card details), e.g. on-line hotel/airline bookings or shop purchases.	4		2b		
(b) (i)	Encryption: $(8)^3$ MOD 30 = 512 MOD 30 **1 mark** = 512 – 510 = 2 **1 mark**	2		2b		
(ii)	Decryption: $(2)^7$ MOD 30 **1 mark** = 128 MOD 30 **1 mark** = 8	2		2b		

Question		Mark	AO1	AO2	AO3	Total
12.	• Big Data– very large datasets (volume)that are so complex (variety of datatypes) that traditional databases are unable to manage and process them within acceptable time frames. (velocity) e.g. Transactional data from ecommerce Machine data from GPS / RFID readers Social media interactions,	2 1	1b 1b			9
	• Data mining is the retrieval and analysis of large sets of data in data warehouses to identify trends and patterns. e.g. identifying market opportunities health trends	2 1	1b 1b			
	• Predictive analytics is a sub-set of data mining used to make predictions about future events, based on individual historical behaviour e.g. weather/ economic forecasting insurance risk assessment targeted marketing	2 1	1b 1b			

Question		Mark	AO1	AO2	AO3	Total
13.	The purpose of the operating system in a personal computer includes: **Indicative content** • Providing a user interface, typically using windows, icons, menus and pointers (WIMP). • Providing an interface to peripheral devices such as keyboard, mouse, speakers, printer… • Running software programs, by loading program code and data into RAM then activating the CPU to execute the program. • Allowing multiple programs to be active at the same time, by sharing processor time. • Providing an interface for local or wide area networking. • Allowing the configuration of hardware, such as: screen resolution, mouse movement response. • Providing device drivers to allow new peripherals to be installed. • Controlling the storage of files in secondary storage, and displaying a catalogue of programs and data files. • Providing security to prevent unauthorised access or alteration of data. • Allowing multiple users to have personal secure access through a password system. • Responding to system errors in a way which minimises data loss. • Displaying previews of common file types, such as: images, video, sound, text. • Handling on-line updates to the operating system.	9	1b			9

Band	Q 13 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 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.

A500U20-1 EDUQAS GCE A Level Computer Science – Component 2 MS A20/DM