GCE AS MARKING SCHEME

SUMMER 2023

AS
COMPUTER SCIENCE - COMPONENT 1
B500U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2023 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 AS COMPUTER SCIENCE - COMPONENT 1

SUMMER 2023 MARK SCHEME

Question	Answer	Marks	AO1	AO2	AO3	Total
1.	**Award one mark for each data type and one mark for each corresponding storage requirement up to a maximum of 6 marks:** • ASCII Character – 8 bits (accept 7) • ASCII String – 8 bits per character (accept 7) • Unicode Character – 16 bits • Unicode String – 16 bits per character • Signed Short Integer – 16 bits • Unsigned Short Integer – 16 bits • Long Integer – 64 bits • Boolean – 1 bit • Real – 32 or 64 bits (accept Float)	6	1b			6
2. (a)	**Award one mark for each of the following:** Y = (6 x 5) + (3 x 4) + (5 x 9) + (2 x 7) • Step 1: Y = 30 + 12 + (5 x 9) + (2 x 7) • Step 2: Y = 30 + 12 + 45 + 14 • Step 3: Y = 42 + 59 • Step 4: Y = 101	4		1b		4
(b)	**Award one mark for each of the following:** • The results from the previous step are required in order to carry out the current step • For example, Y = 42 + 59 cannot be added together until the previous step (Y = 30 + 12 + 45 + 14) has been carried out	2		1b		2
3.	**Award one mark for each of the following up to a maximum of two marks:** • When data is fragmented it is split • and stored on different parts of the disk	2	1b			4
	Award one mark for each of the following up to a maximum of two marks: • An SSD drive uses direct access to data (files) • so there would be no deterioration read times as there's no physical read-head to move.	2	1b			

Question	Answer	Marks	AO1	AO2	AO3	Total
4.	**Award one mark for each of the following:** • Mask: `0010` • Logical operator: `AND` • Bit-wise operation: `0000` Accept a solution using XOR	3		1a		3
5. (a)	**Award one mark for each of the following up to a maximum of three:** • The functions have gone through multiple rigorous testing and so they work. • The functions use efficient code optimized for maximum performance • They save considerable development time • The functions are portable	3	1b			4
	Award one mark for any one of the following: Examples include: • sqrt() determines the square-root of a number • printf() is output to the screen • scanf() is read input from the screen • getchar() is return characters typed on screen • putchar() is output a single character to the screen • fopen() is open a file, and • fclose() is close a file Award a mark for any suitable example not on the list.	1	1b			
(b)	**Award one mark for each of the following up to a maximum of four:** • Programs developed using low level languages are faster to execute • and memory efficient • Programmers can utilise processor and memory in better way using a low level language • There is no need of any compiler or interpreters to translate the source to machine code. Thus, cuts the compilation and interpretation time. • It can directly communicate with hardware devices. • Allows the developer to manipulate registers and the CPU directly. • Instructions are directly linked with the instruction set of the processor and are based on the design of the processor	4	1b			4

Question	Answer	Marks	AO1	AO2	AO3	Total
6.	**Award one mark for each of the following:** $X.\left(\overline{X} + Y + 0\right) + \overline{X}.\left(1 + Y\right) + Y.\left(Y.\overline{Y}\right)$ • $X.\left(\overline{X} + Y\right) + \overline{X}.\left(1 + Y\right) + Y.\left(Y.\overline{Y}\right)$ • $X.\left(\overline{X} + Y\right) + \overline{X}.\left(1 + Y\right) + Y.\left(0\right)$ • $X.\left(\overline{X} + Y\right) + \overline{X}.\left(1 + Y\right)$ • $X.\left(\overline{X} + Y\right) + \overline{X}.\left(1\right)$ • $X.\left(\overline{X} + Y\right) + \overline{X}$ • $X.\overline{X} + X.Y + \overline{X}$ • $X.Y + \overline{X}$ DO NOT award any marks for a solution that <u>only</u> uses a truth table with <u>no final expression</u>	7		1b		7
7. (a)	**Award one mark for each of the following:** • 01000.10011_2 • 0.100010011_2 • 0100_2 • 8.59375_{10}	4		1b		4
(b)	**Award one mark for each of the following up to a maximum of 4:** Absolute error • 8.59375_{10} - 8.6_{10} • = -0.00625_{10} Relative error • -0.00625_{10} / 8.6_{10} • = -0.0007 **Accept:** percentage and carry forward from 7a **CONDONE** incorrect calculation if the fraction is correct • Increase the size of the mantissa	4 1		1b 1b		5

3

Question	Answer	Marks	AO1	AO2	AO3	Total
8. (a)	**Indicative content**					
| | ```
1  Start Procedure DeleteRecord
2  studentID is integer
3  studentTotal is integer
4  deleteID is integer
5  deleted is boolean
6
7  open gradesFile for input
8  open tempFile for output
9
10 output "Enter ID to be deleted:"
11 input deleteID
12
13 set deleted = FALSE
14
15 while (NOT EOF(gradesFile)) AND
   (deleted = FALSE)
16
17    read gradesFile, studentID,
   studentTotal
18
19    if deleteID = studentID Then
20        set deleted = TRUE
21    else
22        write tempFile, studentID,
   studentTotal
23    end if
24
25 end while
26
27 While NOT EOF(gradesFile)
28    read gradesFile, studentID,
   studentTotal
29    write tempFile, studentID,
   studentTotal
30 end while
31
32 close gradesFile, tempFile
33 copy tempFile onto gradesFile
34
35 End Procedure
``` | | | | | |
| | **Award one mark for each of the following:**
• Input record to be deleted
• Loop through file reading each record
• Comparison of ID against read record
• Skip deleted record
• Loop until EOF
• Copy rest of records into `tempFile`
• Replace `gradesFile` with `tempFile` | 7 | | | 1b | 7 |

Question	Answer	Marks	AO1	AO2	AO3	Total
(b)	**Award one mark for each of the following up to a maximum of two:** • Archiving is the process of moving data that is no longer actively used • to a separate storage device / different location for long-term retention / use at a later date / legal requirement to retain data • to free up disk space	2	1b			2
9.	**Award one mark for each of the following up to a maximum of eight:** • Process management o Scheduling of processes o Multitasking o Utilisation of the CPU • Memory management o The OS handles memory allocation o Sharing of memory among different processes • File system management o Hierarchical structure to files and directories o Allowing storage and retrieval of data on storage devices • Device management o Input and output devices o Handling device drivers • User interface o Provides an interface for users to interact with the computer system o Command-line interfaces o Graphical user interfaces (GUIs) • Security and access control o Authentication o Authorisation o Access control • Error handling o Error messages and crash recovery • Power management • Performance monitoring and optimisation • Backup and recovery • Manages spooling.	8	1b			8

Question	Answer	Marks	AO1	AO2	AO3	Total
10.	**Award one mark for each of the following up to a maximum of four marks per application:** • Batch processing 　o Example: payroll / utility billing 　o Time sheets are collected for e.g. a monthly operation etc. 　o Process is carried out with no user interaction 　o Batch processing may avoid using computer resources at times when demand is high /off-peak 　o Errors are stored in a file for later use and not dealt with as they occur • Real-time processing 　o Example: nuclear power station to control reactor temperature by continuously monitoring the temperature which is input to the system. 　o These Inputs are processed very quickly 　o Processing needs to be quick enough to deliver output in time 　o Output adjusted accordingly 　o This means that accidents can be avoided. • Real-time transaction processing 　o Example: theatre selling tickets online 　o A seat is booked and the record is updated very quickly 　o Record is locked during update 　o Availability very quickly decreases by one 　o This avoids double booking a seat.	8	1b			8
11. (a)	**Award one mark for each of the following:** • The algorithm sorts data into ascending order / logical error / Line 12: `if myArray[i] > myArray[i + 1] then` • `if myArray[i] < myArray[i + 1] then`	2		1b		2
(b)	Award one mark for each of the following: • **Lines:** 9 **to** 19 　• Allows passing through the array several times until no swaps are made / clear pass. • **Lines:** 11 **to** 18 　• Passes through the array once making a swap where necessary.	4		1b		4

6

Question	Answer	Marks	AO1	AO2	AO3	Total
(c)	**Award one mark for each of the following:** • **Lines:** 12 **to** 17 • Checks to see if the value stored in element is greater than / less than the value stored in the next element.	2		1b		2
(d)	**Award one mark for each of the following:** • Insertion sort • An insertion sort removes one element from the input data, finds the location it belongs within the sorted list, and inserts it there. • It repeats until no input elements remain. **Accept** other sorts – **not** bubble	3		1b		3

Question	Answer	Marks	AO1	AO2	AO3	Total
12.	**Award one mark for each of the following up to a maximum of five:** **2D Images** • Create bitmap and vector images • Creation of illustrations, drawings and digital art • Advanced image editing • Use a range of brushes, textures, and colour blending options • Manipulation of typography / various text effects • Logos, banners, posters, and other visual materials. **3D Images and Modelling** • Create 3D objects / characters / environments / building structures • Texturing / realistic materials to achieve lifelike images • Lighting conditions / realistic illumination • Animation of objects, characters, and scenes • Defining motion and physics-based simulations • Creation of virtual reality (VR) content • Creation of augmented reality (AR) content. **Accept any other suitable example**	5	1b			5
13.	**Award one mark for each of the following up to a maximum of six:** • Levels of permitted access – certain users would have different/restricted access to certain data or parts of the system • Write-protect mechanisms – only certain users will have permission to write/edit data already stored on the system. • Unique username and a strong secure password – the organisation limits access to the network by ensuring that all authorised users have unique username and a strong secure password. • Access rights – access to confidential files on the network is limited to authorised users only by assigning access rights to users that only allow certain users to access specified area of the network and/or specified files. • Encryption – hackers are prevented from reading the confidential files even they gain access to it by encrypting the files • Encryption – an encryption key is used and known only by the organisation • Firewall – the servers would be protected with firewall software blocking / checking all network traffic entering or leaving specified ports / stop programs accessing the internet	6	1b			6

Question	Answer	Marks	AO1	AO2	AO3	Total
	• Antivirus software – file servers would be protected with antivirus software which regularly scans all files stored on them for possible infection by malware • Antivirus software – email server would be protected with antivirus software and all incoming emails would be scanned to see if attached files are infected • Antivirus software – workstations would be protected with antivirus software and all files from external media would be scanned before they're allowed to be accessed • Accounting or auditing software – all files accessed by a user are recorded in an activity log					

9

Question	Answer	Marks	AO1	AO2	AO3	Total

14.	**Indicative content**
	• Technical Feasibility
	  o Is the required technology and infrastructure are available or can be acquired
	  o Can the proposed system be integrated with existing systems and infrastructure
	  o Are the necessary skills and expertise available to develop and maintain the system.
	• Economic Feasibility
	  o Estimating the project's costs
	  o Analysing the potential benefits and returns on investment
	  o Is the project financially viable / do the benefits outweigh the costs.
	• Operational Feasibility
	  o Does the proposed system align with the organisation's operational processes and requirements
	  o The impact of the system on current operations, workflows and staff
	  o Can the system be effectively integrated into existing business processes.
	• Schedule Feasibility
	  o The time and resources required for system development and implementation
	  o Can the proposed project be completed within the desired timeframe
	  o The potential risks and dependencies that may affect the project timeline.
	• Legal and Regulatory Feasibility
	  o Compliance with relevant laws, regulations, and industry standards
	  o Potential legal or regulatory barriers that may impact the system implementation
	  o Privacy or security concerns associated with the proposed system.
	• Organisational Feasibility
	  o Analysing the organisational culture and readiness for change
	  o Does the proposed system align with the organisation's strategic objectives and goals
	  o The level of support and commitment from stakeholders and management.
	• Political Feasibility
	  o Will the system be accepted by decision makers
		10	1b			10

Band	AO1.1b Max 10 marks
3	**8-10 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 indicative content. Clear knowledge is defined as a response that provides eight to ten relevant detailed points which relate to an extensive amount of the indicative content • addressed the question appropriately with minimal repetition and no irrelevant material • has presented a balanced discussion and justified their answer with examples • used appropriate technical terminology referring to the indicative content confidently and accurately.
2	**4-7 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 as specified in the indicative content. Satisfactory knowledge is defined as a response that provides four to seven points as signalled in the indicative content. • has presented a discussion with limited examples • used appropriate technical terminology referring to the indicative content.
1	**1-3 marks** The candidate has: • written a response that that lacks sufficient reasoning and structure • produced a discussion which is not well developed • attempted to address the question but has demonstrated superficial knowledge of the topics specified in the indicative content. Superficial knowledge is defined as a response that provides one to three points as signalled in the indicative content • used limited technical terminology referring to the indicative content.
0	**0 marks** Response not credit worthy or not attempted.

Total	100	57	36	7	100