GCE AS MARKING SCHEME

SUMMER 2024

AS
COMPUTER SCIENCE - UNIT 1
2500U10-1

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCE AS LEVEL COMPUTER SCIENCE - UNIT 1

SUMMER 2024 MARK SCHEME

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<tr><th>Q</th><th>Answer</th><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th></tr>
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<table>
<tr><th>P</th><th>Q</th><th>R</th><th>$\overline{Q}$</th><th>$P \oplus Q$</th><th>$P + \overline{Q}$</th><th>$R.(P + \overline{Q})$</th><th>X</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
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Award one mark for each of the following, up to a maximum of five marks:
• Correct inputs P, Q and R
• Correct $\overline{Q}$ column
• Correct $P \oplus Q$ column
• Correct $P + \overline{Q}$ column
• Correct $R.(P + \overline{Q})$ column

Award six marks for correct inputs and X column.
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Q	Answer	AO1	AO2	AO3	Total
2 (a)	**Award one mark for each of the following, up to a maximum of five marks:** • Source address • Destination address • Reassembly information • Sequence and acknowledgement numbers / tracking information • Data itself • Checksum / error handling • Protocol type • Header length • Flags • Payload size.	5			5
2 (b)	**Award one mark for each of the following, up to a maximum of three marks:** • Network collisions occur when two sets of data are detected on the network simultaneously • The collision detection process involves monitoring the network to identify when a collision occurs • Once detected, a computer waits for a short (random) time then sends again.	3			3

Q	Answer	AO1	AO2	AO3	Total
3	**Award one mark for each simplification, up to a maximum of seven marks:** $A.(B+C)+\overline{C}.(A+C)+B.\left(B+\overline{A}\right)$ **Indicative content** • $A.B+A.C+\overline{C}.A+\overline{C}.C+B.B+B.\overline{A}$ • $A.B+A.C+\overline{C}.A+\overline{C}.C+B+B.\overline{A}$ • $A.B+A.C+\overline{C}.A+B+B.\overline{A}$ • $B.(A+1+\overline{A})+A.C+\overline{C}.A$ • $B+A.C+\overline{C}.A$ • $B+A.\left(C+\overline{C}\right)$ • $B+A.(1)$ **Award eight marks for correct simplification:** • $B+A$		8		8
4 (a)	**Award one mark for the following:** • The number of bits that can be processed as a single unit by the CPU.	1			1
4 (b)	**Award one mark for each of the following, up to a maximum of four marks:** • 27_{10} `00011011` • $7E_{16}$ `01111110` • Carry `111111` • Answer `10011001`		4		4
4 (c)	**Award one mark for each of the following, up to a maximum of three marks:** • Truncation: 101.0_2 • Absolute Error: 0.3125_{10} • Relative error: 0.3125 / 5.3125 = 0.0588 (Accept 0.06 / 5.88% / 6%)		3		3

Q	Answer	AO1	AO2	AO3	Total
5	**Indicative content** 1 Declare Subroutine ConvertLength 2 length is real 3 conversionType is string 4 5 do 6 output "Please input next length" 7 input length 8 if length >= 0 then 9 if length = val(length) then 10 output "Please input conversion type" 11 input conversionType 12 if conversionType = "cm" then 13 set length = length * 2.54 14 output "Length in cm is", length 15 end if 16 else 17 if conversionType = "m" then 18 set length = length * 0.0254 19 output "Length in m is", length 20 end if 21 else 22 output "Incorrect value entered" 23 end if 24 end if 25 while (length > 0) 26 End Subroutine **Award one mark for each of the following, up to a maximum of eight marks:** • Declare or initialise variables • Loop through values input • Input length • Validation check (number) with suitable error message • Input conversion method • Correct conversion (one only) • Output conversion (one only) • Rogue value to terminate loop.			8	8

Q	Answer	AO1	AO2	AO3	Total
6	**Award one mark for each of the following, up to a maximum of four marks:** • Fixed length record has same number of **bytes / characters** in each record and same number of fields, whereas variable length record has different number of bytes in each record or different number of fields • Fixed length records are easier to program as it can be calculated know how much space will be required whereas variable length record makes it difficult to calculate how much space will be required • Fixed length records are quicker to process (read/write) by computer as start and end locations are known whereas variable length records are slower to process (read/write) by computer as start and end locations have to be calculated at read/write time • Fixed length record wastes storage space as fields have blank space whereas variable length record saves storage space as no blank space • Fixed length record will truncate long fields whereas variable length record avoids truncation as each field can extend to accommodate any number of characters. **Award one mark for each of the following, up to a maximum of two marks** • Fixed length example: DOB / NINO / Tel Number • Variable length example: Surname / Address	4 2			6
7	**Award one mark for each of the following, up to a maximum of six marks:** Sequential file • Accessed by reading the file from beginning to end • File access is quicker where many records need to be accessed (as no need to use index) • No required for storage space for index. Indexed sequential file • Includes a (separate) index from the main data file • Index contains information about the location of each record in the file • Allows for direct access to specific records • Faster access to record via index, compared to a simple sequential file • Periodically, the index would need to be reorganised.	6			6

Q	Answer	AO1	AO2	AO3	Total
8	**Award one mark for each of the following, up to a maximum of four marks:** • Access levels / rights – 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. • Encryption – unauthorised users are prevented from reading the confidential files even they gain access to it because the data is unintelligible / scrambled • Firewall - the servers would be protected with firewall software blocking / checking all network traffic entering or leaving specified ports / stop programs accessing the internet • Antivirus software - regularly scans all files stored on them for possible infection by malware.	4			4

Q	Answer	AO1	AO2	AO3	Total
9 (a)	**Award one mark for each of the following, up to a maximum of two marks:** • `factor` • A fixed value used in an algorithm that remains unchanged throughout the execution of the program.		2		2
9 (b)	**Award one mark for each of the following, up to a maximum of two marks:** • `i / num` • A placeholder used to store and manipulate data.		2		2
9 (c)	**Award one mark for each of the following, up to a maximum of two marks:** • `if i MOD 2 = 0` • Execute a set of instructions if a condition is met.		2		2
9 (d)	**Award one mark for each of the following, up to a maximum of two marks:** • `while (i <= 10)` • Repeatedly execute a set of instructions until a condition is met.		2		2
10 (a)	**Award one mark for each of the following, up to a maximum of two marks:** • An object is an instance of a class • An object represents a specific occurrence of a class (unique properties and behaviours) • A class is a template for an object • Classes are used to define an object's attributes and methods • An object may inherit methods and attributes from a class.	2			2
10 (b) (i)	**Award one mark for the following:** • `Person`		1		1
10 (b) (ii)	**Award one mark for the following:** • `Pupil / Staff`		1		1
10 (b) (iii)	**Award one mark for the following, up to a maximum of one mark:** • `getEmergencyContact() : String` • `getStaffID() : Integer`		1		1

Q	Answer	AO1	AO2	AO3	Total
10 (c)	**Award one mark for each of the following, up to a maximum of three marks:** • Public (+) - any class can access the attribute or call the method • Private (-) - only the current class will have access to the attribute or method • Protected (#) - only the current class and its subclasses will have access to the attribute or method.	3			3
11 (a)	**Award one mark for each of the following, up to a maximum of four marks:** • step-by-step tutorials for the main features of the system • guide on how to install software • licence information • reference manual • online help, at the level of both individual controls, such as input fields, and at the task level • error messages and trouble-shooting guide • frequently asked questions (FAQs) detailing common questions and problems • glossary.	4			4

Q	Answer	AO1	AO2	AO3	Total
11 (b)	**Award one mark for each of the following, up to a maximum of four marks:** • Any form of diagrams used in analysis and design • Descriptions of procedures and subroutines used • The data structure: o What data structures have been used, database table designs and any other information about what data needs to be stored. • Algorithm designs: o Algorithms will normally be presented in pseudo-code or flowchart form. • Annotated code listings: o Code listings that abide by the coding standards set out by the development company. Normally self-documenting and/or annotated. • Variable lists: o Lists of the key variables listing their data types and purpose. More temporary variables, such as loop counters, would not be included. • Data dictionary: o This will describe all of the fields that need to be stored in the data structure including data type, size, relationship with other tables and a description. • Design documents: o Any relevant documentation from design phase. • Hardware and software requirements. o Performance o Storage o Networking o Compatibility • Operating system • Configuration guide and options: • How the system can be configured, which could be through a menu system or by editing configuration files.	4			4

Q	Answer	AO1	AO2	AO3	Total
12	**Award one mark for each of the following, up to a maximum of six marks** • **Editor:** this allows a programmer to enter and edit source code/annotation • **Interpreter:** Translates each line/a single line of source code and executes it • **Automatic formatting**: Correctly indents code • **Automatic colour coding:** Changes key words, variables, literals and annotation to different colours • **Linker:** this is a program which allows previously compiled code, from software libraries, to be linked together • **Loader:** this is a program which loads previously compiled code into memory. • **Debugger:** this is a program which helps locate, identify and rectify errors in a program • **Trace:** this is a facility which displays the order in which the lines of a program are executed, and possibly the values of variables as the program is being run • **Break point:** this is a facility which interrupts a program on a specific line of code, allowing the programmer to compare the values of variables against expected values. The program code can then usually be executed one line at a time. This is called single-stepping • **Variable watch:** this is a facility which displays the current value of any variable. The value can be 'watched' as the program code is single-stepped to see the effects of the code on the variable. Alternatively a variable watch may be set, which will interrupt the program flow if the watched variable reaches a specified value • **Memory inspector:** this is a facility which will display the contents of a section of memory • **Emulator:** will provide an emulator to run the code/app so no physical device required • **Context sensitive menu:** IDE suggests available options • **Statement completion**: IDE will complete a statement such as adding an 'end if' to an 'if' statement • **GUI creation:** Allows programmer to create a GUI by dragging and dropping controls (buttons, etc...) onto a form. • **Publisher:** facility to package up and deploy program as an easy to install package • **Code optimisation:** Warning message when variables have been declared but not used.	6			6

Q	Answer	AO1	AO2	AO3	Total
13 (a)	**Award one mark for each of the following, up to a maximum of three marks:** • Lexical analysis is the first phase of compilation • It is performed by a program known as the lexer • It converts the high-level code into a sequence of tokens • Redundant parts of the source code, such as comments and unneeded spaces, are removed • The lexer converts source code into a sequence of tokens • A symbol table is created to provide the compiler with quick access to the contents of the source code • Information about identifiers, arrays, parameters and subroutines etc. is stored in the symbol table • As the lexer works its way through the source code, it checks to see if the lexeme already exists in the symbol table and if not, a new entry is added • The output is a sequence of tokens that is sent to the parser for syntax analysis.	3			3
13 (b)	**Award one mark for each of the following, up to a maximum of three marks:** • Semantic analysis is the third stage of compilation • Variables are checked to ensure that they have been properly declared, used and are within scope by checking it against the symbol table • Variables are checked to ensure they are of the correct data type, e.g. real values are not being assigned to integers • Tokens are checked for any misuse of reserved identifiers • Operations are checked to ensure that they are legal for the type of variable being used, e.g. you would not try to store the result of a division operation as an integer • If statements are checked to ensure they can evaluate if the condition is true or false • Exit conditions for a loop are evaluated to see if the condition is true or false.	3			3

Q	Answer	AO1	AO2	AO3	Total
14	**Indicative content** Interface • Provides graphical user interface with meaningful icons / avoid text input / drop-down menus • Can provide a command line interface • Allows customisation of interface e.g. change desktop colours / layout • Allows access to system settings such as hardware • Allows copying / deleting / moving / sorting / searching of files or folders • Allows creation of shortcuts • Controls security using passwords or access permissions • Allows user to have more than one window open / Allows user to switch between tasks (programs/windows) • Provides user with error/warning/help messages. Resources • Communicates with and sends data output to a printer / monitor / other valid output device • Communicates with and receives data input to a keyboard / mouse / other valid input device • In spooling, data is stored on hard disk / in memory / stored in a queue / in a buffer • Manages backing store by ensuring that data is stored and can be retrieved correctly from any disk drive • O/S creates and maintains a filing system such as FAT or NTFS • Organise files in a hierarchical directory structure • O/S offers compression which can be used to save disk space • The O/S manages memory (RAM) by ensuring all programs and data including itself is stored in correct memory locations/do not try to occupy the same memory location • The O/S manages memory (RAM) by ensuring all programs and data have enough memory allocated • The O/S can utilise virtual memory when not enough memory (RAM) is available to run a program • Ensures different processes can utilise the CPU and do not interfere with each other or crash • On a multi-tasking O/S, the O/S ensures that all tasks appear to run simultaneously.	10			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 on operating systems from each of resources **and** interface 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 on operating systems from resources **and / or** interface 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 on operating systems from resources **or** interface 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**	**60**	**32**	**8**	**100**