GCE A LEVEL MARKING SCHEME

SUMMER 2025

A LEVEL
COMPUTER SCIENCE - UNIT 4
1500U40-1

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.

GCE A LEVEL COMPUTER SCIENCE - UNIT 4

SUMMER 2025 MARK SCHEME

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
1	**1 mark** for limitation and **1 mark** for associated description to a maximum of **6 marks** **Indicative content** Serial section of an operation or program (1). Data that relies on the result of a previous operation cannot be made parallel (1). Parallel computing architectures and multi-threaded applications can be complex and difficult to program (1) and may require specialised skills and knowledge (1). Communication between processors or cores can be slow (1). This may limit the performance gains of parallel computing (1). When multiple processors or cores work together, synchronisation issues may arise (1) which can lead to errors or reduced performance (1). Number of cores. More cores allow a CPU to handle multiple tasks simultaneously (1), leading to an increase in overall performance (1).	6	6			**6**

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th></tr>
<tr><td>2 (a)</td><td>2 marks for correct conversions, 1 mark for correct total and 1 mark for carry bits to a maximum of 4 marks

63 0 0 1 1 1 1 1 1
+30 0 0 0 1 1 1 1 0
0 1 0 1 1 1 0 1
1 1 1 1 1</td><td>4</td><td></td><td>4</td><td></td><td rowspan="3">10</td></tr>
<tr><td>(b)</td><td>1 mark for correct negative number, 1 mark for correct shift 1, and 1 mark for correct shift 2, or identification of overflow to a maximum of 3 marks

<table>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>-58_{10}</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>Shift 1</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>Shift 2</td></tr>
<tr><td>1</td><td colspan="7">Overflow occurs</td><td>Shift 2</td></tr>
</table></td><td>3</td><td></td><td>7</td><td></td></tr>
<tr><td>(c)</td><td>1 mark for explanation, 2 marks for suitable 4 bit examples to a maximum of 3 marks.

Indicative content

In two’s complement, for negative numbers, the MSB retains its value. In sign and magnitude, the MSB becomes the sign bit (0 is positive) but has no value. This causes errors when carrying out arithmetic operations (1)

Examples

2C -6 + 1 1 0 1 0 + 0 0 0 1 = 1 0 1 1 = -5 (1)
SM -6 + 1 1 1 1 0 + 0 0 0 1 = 1 1 1 1 = -7 (1)

Accept any suitable examples.

Do not accept representation of 0 in Sign and Magnitude as a valid response to the question.</td><td>3</td><td></td><td>10</td><td></td></tr>
</table>

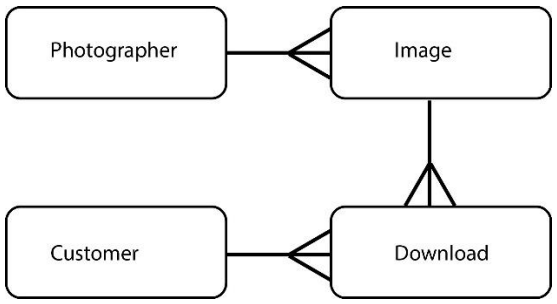
Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
3 (a)	**1 mark** for each correct stage in the conversion. 75.7510 1001011.1100 0.10010111100 with 0111 0100101111000111 Do not penalise correctly placed decimal point in final floating point number?	3		13		**9**
(b)	1 **mark** for each correct point to a maximum of **3 marks** The exponent will produce a decimal part = $0.625_{10.}$ (1). Truncation will produce an error of 0.625_{10} (1) whereas rounding will produce an error of 0.375_{10} (1). Rounding will produce a more accurate integer (1). Accept errors expressed as binary fractions (1), if followed by a correct statement on accuracy.	3		16		
(c)	**1 mark** for each correct stage in the conversion Calculate exponent: 4_{10} Move binary point: 01101.001 Convert to Decimal: 13.12510	3		19		

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
4 (a)	**1 mark** for basic explanation, **1 mark** for associated expansion to a maximum of **4 marks.** **Indicative content** **Multi-access OS** - allows multiple users to access underlying hardware resources simultaneously. (1) Users have a local view of the system / working model and can create, update, and delete files in their local area. (1) Changes remain hidden from other users until saved from their working model to the master system. (1) **Multi-tasking OS** - enables simultaneous execution of multiple tasks, such as processes, programs, etc. (1). Multiple tasks or processes share the CPU using scheduling and interrupts (1) to determine which task should be running and when a waiting task should be processed. (1) Multitasking creates the appearance of many threads of execution running concurrently (1), Execution is carried out as a series of time slices controlled by a scheduling algorithm (1).	4	10			**10**
(b)	**1 mark** for identifying a method, **1 mark** for associated expansion to a maximum of **6 marks.** Fixed partitioning (1) The simplest method where. the partitions are made before execution or during system configuration (1). Variable partitioning (1) The number of partitions is fixed but the sizes vary to accommodate different processes. (1). Dynamic Partitioning (1) Partitions are made during run-time according to processes' needs / size (1). Accept description of contiguous and non-contiguous / paging and segmentation to a maximum of **2 marks.**	6	16			

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
5	Award marks for content of program code to a maximum of **4 marks.** **1 mark** for input of mark and pass mark **1 mark** for subtracting pass mark from mark **1 mark** for BRP and label1 **1 mark** for both outputs 1 pass 0 not passed, if produced by the program **1 mark** for correct DAT statement(s) Indicative content INP STA mark INP STA passmark LDA mark SUB passmark STA result BRP label1 BRA label2 label1 OUT 1 HLT label2 OUT 0 HLT mark DAT passmark DAT result DAT	4			4	**4**

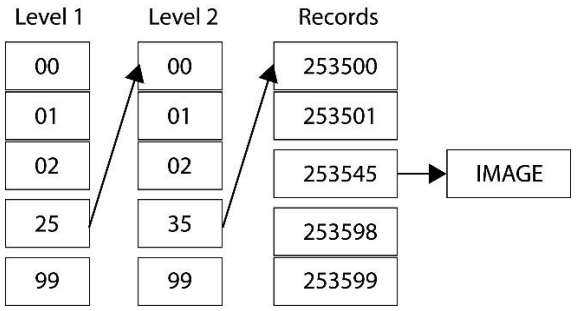
Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
6	**1 mark** for basic explanation of each topic, **1 mark** for associated expansion and **1 mark** for suitable example to a maximum of **6 marks**. **Indicative content** The discovery phase - Data mining refers to the activity of cleaning and investigating big data sets to look for relevant information / patterns / relationships (1) using sophisticated search operations that return targeted and specific results (1). Examples (1) include Service providers collate data to produce probability scores that indicate the likelihood of customers switching and then to offer them incentives / discounts to stay. Supermarket offers via loyalty card programs. Crime prevention data to indicate where and when crimes are most likely Retailers targeting marketing at identified customer preferences Predictive analytics. The interpretation and application phase. Use of mathematical / computational models / algorithms to predict future trends / events (1) and support decision making based on relevant historic data. (1). Examples (1) include More personalised and targeted marketing based on previous purchases / interests shown. Operational planning by checking if current resources are adequate to meet future demand. Review of cost-effectiveness to establish which marketing channels generate the better income.	6	22			**6**

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
7 (a)	**1 mark** for each of the following; SELECT correct fields FROM Customer (1) SELECT CustomerNo FROM Event (1) WHERE correct criteria (1) Indicative content SELECT Surname, ContactTel FROM CUSTOMER WHERE CustomerNo = (SELECT CustomerNo FROM EVENT WHERE Location = Bristol); Accept Join SELECT Surname, ContactTel FROM CUSTOMER (JOIN EVENT on CustomerNo, WHERE Location = Bristol); SELECT Surname, ContactTel FROM CUSTOMER (ORDER JOIN EVENT on CustomerNo),WHERE Location= Bristol;	3			7	**8**
(b) (i)	**1 mark** for each of the following, to a maximum of **3 marks.** Correct construct (CREATE TABLE with brackets in correct places) (1) Identifying PRIMARY KEY (1) NOT NULL key field (1) (should be present everywhere) Numeric (2) for ID (1) / accept Int Indicative content CREATE TABLE Photographer (ID numeric (2) NOT NULL, Initial char NOT NULL, Surname Char NOT NULL, Specialism Char NOT NULL, Degree Boolean / Char NOT NULL, Contact Char NOT NULL, PRIMARY KEY (ID));	3			10	
(b) (ii)	**1 mark** for INSERT INTO, **1 mark** for correct fields in correct order **Indicative content** INSERT INTO Photographer VALUES (15, M, Smith, Sports, TRUE, Smith33mm@iCloud.com) Ignore field names	2			12	

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
8 (a)	**1 mark** for four tables, as indicated. **1 mark** per correct one-to-many relationship **Indicative content**  	4		23		**11**
(b)	**1 mark** for Primary key in each table, (three tables minimum) and **1 mark** for each foreign key field, appropriately identified, to a maximum of **4 marks**. Ignore additional fields **Indicative content:** Photographer [PhotographerID **[P],** Name] Image [ImageID **[P],**PhotographerID **[F],** Cost] Download [DownloadNumber **[P],** ImageID **[F],** CustomerID **[F]**] Customer [CustomerID **[P],** Surname, Initial]	4		27		
(c)	**1 mark** for each correct advantage and **1 mark** for identifying a suitable field, to a maximum of 3 **marks**. **Indicative content:** Advantages Faster data entry/ quicker to select from a list than to type each individual entry. (1) Enhanced accuracy / lessens the risk of typing errors / spelling mistakes. (1) Limits / controls input options (1) Field 'Category' (1), accept 'Year'	3		30		

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
9 (a)	**1 mark** for correct library, **1 mark** for correct library units, **1 mark** upload speed **1 mark** for time, **1 mark** for rounding hours, to a maximum of **4 marks**. Library: 600 000 x 4 MB = 2400 000 MB x 1024 = 2458 x 10^6 KB x 1024 = 2516582 x 10^6 B x 8 =20132659 x 10^6 b (Allow calculation based on converting 1 X 4MB image to Mbits x 600 000.) Upload speed: 500 Mbps x 1024 = 512000 Kbps = 524 x 10^6 bps Time 20132659 x 10^6 b / 524 x 10^6bps 38421 s / 60 = 640 m / 60 = 10.67 = 11 hours Allow calculation based on decimal upload speed, with time calculation includes; = 671 m / 60 = 11.18 = 11 hours	4		34		**8**
(b)	**1 mark** for basic description, **1 mark** for associated expansion to a maximum of **4 marks.** **Indicative content** Image size. The images could be compressed (1) using a lossless method to retain quality (1). Distance. A more local cloud provider could be used to reduce time lag due to distance (1) and to reduce latency caused by multiple intermediate routers / devices (1) Upload speed. A provider offering greater upload speeds (1) Upload time of day. Consideration of the number of users sharing bandwidth at various times of the day. (1)	4		38		

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
10 (a)	**1 mark** for a correct task and **1 mark** for an associated description to a maximum of **6 marks**. **Indicative content.** Manage user accounts / access (1). configure user accounts / define access policies / modify restrictions and access scopes / multiple user access:(1) Making data backups (1). manage backups / move backups to third-party locations such as cloud storage for safekeeping (1). Creating /maintaining the database. (1) Definition, creation and linking of tables / forms build queries and reports (1) Data integrity control. (1) maintaining and assuring the accuracy, validity, and consistency of data (1). Performance optimisation (1). Creating optimised indexes and SQL queries to achieve the best performance from the database (1). Data recovery (1). DBMS provides the necessary tools to restore databases to their previous state (1) DBMS can be used to support effective user collaboration (1) by enabling simultaneous access to a shared data source. (1)	6	28			**12**

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
10 (b)	**1 mark** for a basic explanation and up to **2 marks** for an associated expansion, **1 mark** for suitable diagram, **2 marks** for description of diagram, to a maximum of **6 marks**. **Indicative content.** Multilevel indexes refer to a hierarchical structure of indexes (1) where each level of the index provides a more detailed reference to the data. (1). The indexes allow faster data retrieval by reducing disk access and improving query performance.(1)  (1) The diagram indicates a two level index for a file containing up to 600,000 images. (1) Image 253545 is required. The image will be found in an average of 300 comparisons as opposed to an average of 300,000 without indexing. (1)	6	34			**6**
11	**1 mark** for basic explanation, and **1 mark** for associated expansion to a maximum of **4 marks.** **Indicative content.** Time-slicing is the process of allocating predetermined maximum times (1) for the bursts during which each program is allowed to run in a multiprogramming system. (1) Polling. The sequential checking of components / routines (1) to determine which component / routine is waiting for processing (1).	4	38			**4**

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
12 (a)	**1 mark** for identification of measurement, **1 mark** for description. **1 mark** for identification of processing, **1 mark** for description, **1 mark** for identification of decision making to a maximum of **4 marks.** **Indicative content.** A biometric device is a security identification and authentication device that uses automated methods of validating a person's identity. The process involves 3 stages. measurement, processing / pattern matching, and decision making. 1. Measurement – the sensing of biometric characteristics, using devices such as a microphone or camera and is essential both for the creation of the reference model and for each authentication trial. Complexities / difficulties include consistency of environmental factors and biological changes such as injuries / aging etc. 2. Processing / pattern matching. Comparing the current data with stored reference models involving complex mathematical algorithms to assess the probability of a match close enough to indicate that a person is the same person from whom the stored reference was obtained. 3. Decision making. A less complex stage to decide whether to authorise / unlock etc or not, depending on the output from stage 2.	4	42			**12**
12 (b)	**1 mark** up to a total of **8 marks** awarded by application of mark bands **Indicative content** **Benefits** Unlike even the strongest passwords biometrics are hard to fake or steal. Easy to use, offer convenience and cannot be forgotten. Little change of some biometrics, such as fingerprints over a person's life.	8	50			

Question	Marking Guidance	Mark	AO1	AO2	AO3	Total
	Are non-transferable and cannot be lost or stolen Elements are universal, be found on all individuals and can be measured and allow for comparisons in the future **Concerns** A biometric system does not necessarily identify an individual. It measures similarity, not identity. Not 100% accurate. There are two types of error a false reject (FR) of an authorised person and false accept (FA) acceptance of a person who is not authorised. This is a problem in any context where privacy and physical security are essential. Inconvenience and intrusion of privacy in having to be photographed / fingerprinted. Cost of the system, e.g. in increasing the fee that has to be paid by individuals for a biometric passport. The facial recognition database enable officials to carry out unauthorised surveillance by monitoring CCTV pictures. Possible errors in the system, (e.g. through misidentifying people in poorly lit streets following a crime, leading to potentially unjust consequences such as incarceration. Possible bias against specific groups, such as people of different races. Mass surveillance and how businesses and other non-governmental organisations use this technology including implications arising from data security and integrity.					
Totals			**50**	**38**	**12**	**100**

Mark Bands

Band	AO1 Max 8 Marks
3	**7-8 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. • clearly addressed the question appropriately with minimal repetition and no irrelevant material • effectively drawn together different areas of knowledge, skills and understanding from all relevant areas across the course of study • used appropriate technical terminology referring to the indicative content 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. • satisfactory knowledge is defined as a response that makes four to six points in areas signalled in the indicative content. • drawn together different areas of knowledge, skills and understanding from at least two areas across the course of study 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 • 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 makes up to three points in all areas signalled in the indicative content. • used limited technical terminology referring to the indicative content.
0	**0 Marks** Response not credit worthy or not attempted.