



GCE A LEVEL MARKING SCHEME

SUMMER 2025

**A LEVEL
COMPUTER SCIENCE - UNIT 3
1500U30-1**

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 3

SUMMER 2025 MARK SCHEME

Q		Answer	AO1	AO2	AO3	Total						
1	(a)	Describe a queue data structure and give an example where it might be used.				3						
		Award 1 mark for each description to a maximum of two and 1 mark for a use. • A queue uses the first in first out (FIFO) principle. • In a queue the last or most recent item of data added to a queue is the last to be removed. • Queues can be implemented using various data structures, such as arrays or linked lists. • Adding an element is called enqueueing and removing an element is called dequeueing Example • Queues are often used to manage processes or tasks waiting to be executed in an operating system. • Print jobs are often placed in a queue and are processed in the order they are received. • Buffering uses queues to temporarily hold data until they have been processed. • Storing browsing history on a web browser	1 1 1 1 1 1 1									
	(b)	A stack is another type of data structure				1						
	(i)	Draw a diagram to show how a stack would store the following names in the order in which they are received, where Jamie is received first. Jamie, Elena, Arjun, Piotr, Julia, Morgan										
		Award 1 mark awarded for table created with Jamie at the bottom and in order as received. <table><tr><td>Morgan</td></tr><tr><td>Julia</td></tr><tr><td>Piotr</td></tr><tr><td>Arjun</td></tr><tr><td>Elena</td></tr><tr><td>Jamie</td></tr></table>	Morgan	Julia	Piotr	Arjun	Elena	Jamie		1		
Morgan												
Julia												
Piotr												
Arjun												
Elena												
Jamie												

Q	Answer	AO1	AO2	AO3	Total												
(ii)	Redraw the diagram to show the stack after two names are popped, and David and then Eleri are pushed.				2												
	Award 1 mark for the correct removal of Julia and Morgan from the top Award 1 mark for the correct addition of Eleri and David in the correct order <table><tr><td>Eleri</td></tr><tr><td>David</td></tr><tr><td>Piotr</td></tr><tr><td>Arjun</td></tr><tr><td>Elana</td></tr><tr><td>Jamie</td></tr></table>	Eleri	David	Piotr	Arjun	Elana	Jamie		1 1								
Eleri																	
David																	
Piotr																	
Arjun																	
Elana																	
Jamie																	
2	This is a diagram of a linked list of names in Alphabetical order. <table><tr><td>Dylan</td><td>Joel</td><td>Lily</td><td>Stevie</td><td>Xander</td></tr><tr><td>●</td><td>→ ●</td><td>→ ●</td><td>→ ●</td><td>→ ●</td></tr></table>	Dylan	Joel	Lily	Stevie	Xander	●	→ ●	→ ●	→ ●	→ ●						
Dylan	Joel	Lily	Stevie	Xander													
●	→ ●	→ ●	→ ●	→ ●													
(a)	Redraw the linked list after Joel has been deleted.				2												
	<table><tr><td>Dylan</td><td>Lily</td><td>Stevie</td><td>Xander</td></tr><tr><td>●</td><td>→ ●</td><td>→ ●</td><td>→ ●</td></tr></table> Award 1 mark for removal/bypass of Joel. Award 1 mark for entire diagram being correct.	Dylan	Lily	Stevie	Xander	●	→ ●	→ ●	→ ●		1 1						
Dylan	Lily	Stevie	Xander														
●	→ ●	→ ●	→ ●														
(b)	Redraw the linked list from part (a) after Wiktor has been added.				2												
	<table><tr><td>Dylan</td><td>Lily</td><td>Stevie</td><td>Xander</td></tr><tr><td>●</td><td>→ ●</td><td>→ ●</td><td>→ ●</td></tr><tr><td></td><td></td><td>Wiktor</td><td></td></tr></table> Award 1 mark for the addition of Wiktor. Award 1 mark for entire diagram being correct.	Dylan	Lily	Stevie	Xander	●	→ ●	→ ●	→ ●			Wiktor			1 1		
Dylan	Lily	Stevie	Xander														
●	→ ●	→ ●	→ ●														
		Wiktor															

Q		Answer	AO1	AO2	AO3	Total																																																						
3	(a)	Draw a truth table to show the value of Q for all possible values of A, B and C for the following Boolean Expression: $Q = A. (\bar{B} + C)$				4																																																						
		<table><thead><tr><th>A</th><th>B</th><th>C</th><th>$\bar{B}$</th><th>$(\bar{B} + C)$</th><th>Q</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr></tbody></table> Award 1 mark for each possible A, B and C are correct Award 1 mark for $\bar{B}$ column correct Award 1 mark ($\bar{B} + C$) correct Award full marks if column Q correct	A	B	C	$\bar{B}$	$(\bar{B} + C)$	Q	0	0	0	1	1	0	0	0	1	1	1	0	0	1	0	0	0	0	0	1	1	0	1	0	1	0	0	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	1	1	1	0	1	1		1 1 1 4		
A	B	C	$\bar{B}$	$(\bar{B} + C)$	Q																																																							
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	(b)	Clearly showing each step, simplify the following Boolean expressions using Boolean algebra, identities and De Morgan's law where appropriate				5																																																						
	(i)	$A. (\bar{A} + B) + \bar{B}. (A + C) + A. B$																																																										
		Award 1 mark for each of the following up to a maximum of 4 for incorrect answer: $A. \bar{A} + A. B + \bar{B}. A + \bar{B}. C + A. B$ $0 + A. B + \bar{B}. A + \bar{B}. C + A. B$ $A. B + \bar{B}. A + \bar{B}. C$ $A. (B + \bar{B}) + \bar{B}. C$ $A. (1) + \bar{B}. C$ $A + \bar{B}. C$ Award full marks for correct answer $A + \bar{B}. C$		1 1 1 1 1 1																																																								
	(ii)	$z. (\bar{z} + \bar{y}) + x. y. (\bar{z} + z)$				5																																																						
		Award 1 mark for each of the following up to a maximum of 4 for incorrect answer: $z. (\bar{z} \cdot \bar{y}) + x. y. (\bar{z} + z)$ $z. \bar{z}. \bar{y} + x. y. (1)$ $z. \bar{z}. y + x. y$ $0 + x. y$ $x. y$ Award full marks for correct answer $x. y$		1 1 1 1 1																																																								

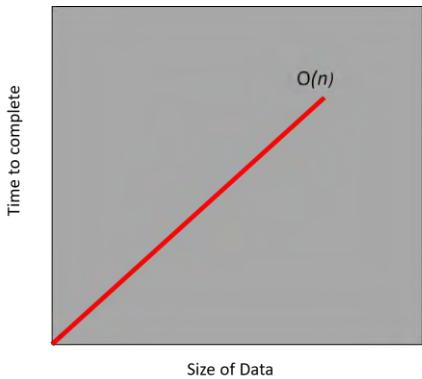
Q		Answer	AO1	AO2	AO3	Total															
4	(a)	Determine the logical operation described by this truth table. <table><tr><th colspan="2">Input</th><th>Output</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	Input		Output	0	0	1	0	1	1	1	0	1	1	1	0				1
Input		Output																			
0	0	1																			
0	1	1																			
1	0	1																			
1	1	0																			
		Award 1 mark for correctly identifying NAND operator	1																		
	(b) (i)	Using the key 11011010_2 show how the XOR operation can be used to encrypt 10110101_2 .				1															
		Award 1 mark for correctly using XOR to encrypt an original value <table><tr><td>Original Data</td><td>10110101_2</td><td></td></tr><tr><td>Key</td><td>11011010_2</td><td>XOR</td></tr><tr><td>Encrypted Data</td><td>01101111_2</td><td></td></tr></table>	Original Data	10110101_2		Key	11011010_2	XOR	Encrypted Data	01101111_2			1								
Original Data	10110101_2																				
Key	11011010_2	XOR																			
Encrypted Data	01101111_2																				
	(b) (ii)	Show how the encrypted value can be decrypted				2															
		Award 1 mark for using the encrypted value when decrypting. Award 1 mark for correctly using XOR to decrypt the encrypted. <table><tr><td>Encrypted Data</td><td>01101111_2</td><td></td></tr><tr><td>Key</td><td>11011010_2</td><td>XOR</td></tr><tr><td>Decrypted Data</td><td>10110101_2</td><td></td></tr></table>	Encrypted Data	01101111_2		Key	11011010_2	XOR	Decrypted Data	10110101_2			1 1								
Encrypted Data	01101111_2																				
Key	11011010_2	XOR																			
Decrypted Data	10110101_2																				

Q	Answer	AO1	AO2	AO3	Total
5	Discuss how Computer Aided Software Engineering (CASE) tools can assist with the designs and development of a system.				8
	Indicative Content • Upper CASE tools are used to support during the planning, analysis and design stage of development. • UML (Unified modelling language diagrams) are often used as visual representations to help developers better understand the structure and behaviour of a system. • UML diagrams can consist of class diagrams, sequence diagrams and activity diagrams. • Diagramming tools can help demonstrate system elements, control flow and data flow of a system. • Central repository tools provides a single point for data diagrams, reports and other related documents for the system. • Analysis tools will focus on inconsistent specifications and involved in diagrams and data flow. • Project management can be used in effective software development process. This CASE tool can support strategic planning, project scheduling, tracking progress, and resource allocation. • Requirement analysis tools are a feature of CASE tools that can establish links between requirements and design elements. • Collaboration tools allow for all team members and developers to work on design documents at the same time and track changes. • Documentation tools, documentation for a software project should start at the beginning of the software process. It should include all phases of the software development life cycle. • CASE tools often have debuggers built in, which can help identify and fix errors, consider other debugging features, such as breakpoints, step through, memory inspection. • Integration with version control systems enables developers to debug code across different versions of the software project. • CASE tools offer capabilities for analysing various metrics related to software quality, performance, and maintainability. These metrics provide insights into the software's complexity, code duplication, cyclomatic complexity, and other factors that impact the overall quality of the system. • Visualisation of metrics through graphs, charts, and reports assists developers and project managers in making data-driven decisions to improve the software's design and maintainability. • CASE tools provide graphical user interface (GUI) design systems that allow developers to create intuitive and visually appealing user interfaces for their software applications.	8			

Q		Answer	AO1	AO2	AO3	Total
		• Drag-and-drop interface builders, layout managers, and widget libraries simplify the process of designing GUI components and arranging them on the screen. • Integration with prototyping and wireframing tools allows designers and developers to collaborate effectively during the GUI design phase, iterating on designs based on feedback and usability testing. • Preview functionality enables developers to visualise how the GUI will appear to end users across various devices and screen resolutions. • Some CASE tools come with integrated compilers or support for multiple programming languages, allowing developers to write, compile, and execute code within the same environment.				
Band		AO1				
		7-8 Marks				
	3	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.				

Q		Answer	AO1	AO2	AO3	Total
6	(a)	Describe the benefits of producing detailed documentation at each stage of the Waterfall approach to system analysis and design.				2
		1 Mark answer Detailed documentation is needed to inform the next stage. 2 mark answer Detailed documentation is needed to inform the next stage. As those that are involved in the next stage may not have been involved in the current stage and will have limited knowledge without effective documentation.	1			
			2			
	(b)	Describe the documentation that is needed for the maintenance stage of the Waterfall approach.				6
		Indicative Content: - Maintenance documentation is essential for ensuring the system remains functional, secure and adaptable over time. Maintenance documentation includes: - annotated listings – Code listings that abide by the coding standards set out by the development company. - variable lists – lists of all the variables that are used in the program and their assigned data type and value, where appropriate - algorithms – normally written in flowcharts or pseudocode - data dictionaries –describes all the fields that need to be stored in the data structure, including data types, size and relationship with other tables. - testing and test reports – all fixes and adaptations should be tested. Evidence of testing through testing strategies and reports should show what was tested, how and the results of testing. - maintenance logs - A log documenting all maintenance activities, including the date, nature of the change, individuals involved, and any issues encountered. This log serves as a historical record and aids in tracking changes over time.	6			
Band		AO1				
		5 – 6 marks				
3		A very good description, which shows: - thorough knowledge and understanding of what technical documentation is produced during the maintenance stage of the Waterfall method of analysis. - a confident grasp of the different technical documentation produced.				
		3 - 4 marks				
2		A good description, which shows: - generally secure knowledge and understanding of what technical documentation is produced during the maintenance stage of the Waterfall method of analysis. - a generally secure grasp of the different technical documentation produced.				
		1 - 2 marks				
1		A basic description, which shows: - some knowledge and understanding of what technical documentation is produced during the maintenance stage of the Waterfall method of analysis. - some grasp of the different technical documentation produced.				
		0 marks				
		Response not creditworthy or not attempted.				

Q		Answer	AO1	AO2	AO3	Total
7	(a)	Describe a situation where an insertion sort is more suitable than other sorting algorithms.				2
		Award 1 mark up to a maximum of 2 • Insertion sort has a space complexity of $O(1)$ • It is a suitable algorithm for small datasets • situations where memory usage needs to be minimised. • Scalability is limited, and for larger datasets, other sorting algorithms with better time complexity may be more appropriate.	1 1			
	(b)	Write an Insertion Sort algorithm for integer values, using pseudo-code, to sort an array of unknown length in ascending order.				7
		Indicative content <pre> Declare InsertionSort(myArray) i is integer j is integer currentItem is integer set n = len(myArray) for i = 1 to (n - 1) set currentItem = myArray[i] set j = i - 1 while (j >= 0 AND myArray[j] > currentItem) set myArray[j + 1] = myArray[j] set j = j - 1 end while set myArray[j + 1] = currentItem next i End Subroutine </pre> Award 1 mark for declare and initialise variables Award 1 mark for setting length of array Award 1 mark for use of outer loop Award 1 mark for use of inner loop Award 1 mark for correct condition of a loop Award 1 mark for swapping of data in array (moving data in the array) Award 1 mark for assigning currentItem (accept any other variable name) into correct position in an array			1 1 1 1 1 1 1	

Q		Answer	AO1	AO2	AO3	Total
8	(a)	This algorithm initialises two arrays. <pre> for i = 0 to N - 1 arrayA(i) = itemA next i for j = 0 to N - 1 arrayB(j) = itemB next j </pre>				
	(i)	Evaluate the efficiency of the following algorithm using Big O Notation.				3
		Award 1 mark for identifying that both the first loop and second loop are both $O(N)$ Award 1 mark for the time complexity for both loops is $O(2N)$ Award 1 mark for determining that the order will be dominated by N			1 1 1	
	(ii)	Determine the growth rate for time performance.				1
		Award 1 mark for determining that the growth rate for time performance is $O(N)$			1	
	(b)	Draw a graph of the algorithm to illustrate and identify its order of time performance. Graph paper is not required.				2
		 Award 1 mark for Time and Size axes labelled correctly Award 1 mark for correct gradient of line			1 1	

Q	Answer	AO1	AO2	AO3	Total
9	A company called Parkwood Vale Cosmetics has a specific structure for email addresses for company employees depending on whether they work in sales or admin. The email addresses are made up of: • Surname with an uppercase letter to start • an uppercase letter to represent a first name initial • an integer • @ sign • followed by either 'salespvc.co.uk' or 'adminpvc.co.uk' Example: DaviesL12@salespvc.co.uk Produce a Backus-Naur Form (BNF) definition for an email address for the company.				5
	<pre> <uppercase>::= "A" "B" "C" "Z" <lowercase>::= "a" "b" "c" "z" <digit>::= "0" "1" "2" "3" "4" "5" "6" "7" "8" "9" <string>::= <lowercase> <lowercase> <string> <integer>::=<digit> <digit><integer> <surname>::= <uppercase><string> <department>::= "salespvc.co.uk" "adminpvc.co.uk" <email>::=<surname><uppercase><integer> "@" <department> </pre> Award 1 mark for each correct BNF notation up to a maximum of 4 marks if incorrect notation used.		1		
			1		
			1		
			1		
			1		

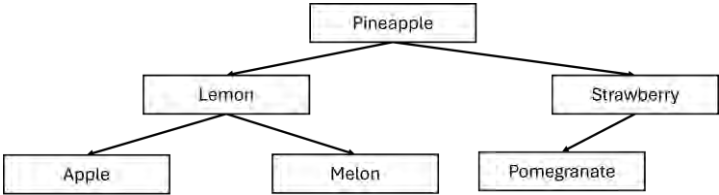
Q	Answer	AO1	AO2	AO3	Total
10	(a) State the difference between the two data compression types				2
	Award 1 mark for each statement up to a maximum of two • Lossy compression reduces a file size • some data is lost during this process and cannot be retrieved. • Lossless compression reduces a files size without loss • original file can be retrieved Do not accept the reverse points for lossy and lossless	1 1			
	(b) A source image file in its original state has a size of 64,000 bytes and is compressed into a file size of 16,000 bytes.				3
	(i) Calculate the compression ratio				1
	$\text{compression ratio} = \frac{\text{size before compression}}{\text{size after compression}}$ $\text{compression ratio} = \frac{64000}{16000}$ $\text{compression ratio} = 4:1$ Award 1 mark for correct answer		1		
	(ii) Calculate the saving percentage				1
	$\text{saving percentage} = \left(\frac{\text{size before compression} - \text{size after compression}}{\text{size before compression}} \right) * 100$ $\text{saving percentage} = \left(\frac{64000 - 16000}{64000} \right) * 100$ $\text{saving percentage} = 75\%$ Award 1 mark for correct answer		1		
	(iii) Calculate the compression time				1
	64 x 0.03 = 1.92 seconds Award 1 mark for correct answer		1		

Q	Answer	AO1	AO2	AO3	Total
11	(a) Other than privacy and monitoring, describe the contents typically found within a code of conduct.				8
	Indicative Content Professionalism: - Guidelines on professional behaviour, including respect for colleagues, clients, and stakeholders when communicating across a network. - Expectations regarding punctuality, communication, and overall work ethic. Conflicts of interest and disclosure requirements: - Guidelines on how employees should handle situations where personal interests may conflict with the organisation's interests. Copyright and Intellectual Property: - Rules about the use and protection of intellectual property, both belonging to the organisation and third parties. - Guidelines on respecting copyrights, trademarks, and proprietary information. Abiding by Laws and Regulations: - A commitment to abide by laws such as DPA and GDPR and Computer Misuse Act - Guidelines on reporting any illegal or unethical activities within the organisation. Damage: - Include guidelines on responsible use of computer systems, networks, and associated resources. - Guidelines on the prevention and precautions to protect computer systems from physical damage. Access Levels: - Specifying that users should only access computer resources for which they have authorisation. - Ensuring staff only have access to data and software that is appropriate to their job requirements. Social Responsibility: - A commitment to corporate social responsibility and ethical business practices. - Guidelines on sustainability, environmental responsibility, and community engagement. Enforcement and Consequences: - Procedures for investigating and addressing violations of the Code of Conduct. - Clearly defined consequences for breaches of the Code of Conduct.	8			

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.

Q		Answer	AO1	AO2	AO3	Total
11	(b)	Describe the methods which can be used to monitor an employee's use of computer systems and compliance with the code of conduct.				6
		Indicative Content Ways of Monitoring: • Network Traffic Analysis: ○ Analysing data packets moving across the network to understand user activities and identify potential security threats. ○ monitor bandwidth usage. • Email Monitoring: ○ Monitoring email communications to prevent unauthorised disclosure of sensitive information. ○ Detecting potential security risks of emails, such as viruses and phishing. • Web Usage Monitoring: ○ Tracking employees' internet usage to prevent access to inappropriate content. ○ Managing bandwidth. ○ Monitoring downloading from web. • Application Usage Monitoring: ○ Monitoring the usage of applications and software to ensure compliance with licensing agreements. ○ prevent unauthorised software installations. ○ manage software resources. Contents regarding monitoring could include: • Transparency and Communication: ○ Transparency and communication about the types of monitoring that may occur should be emphasised. ○ Include information that employees will be informed about the types of monitoring conducted, and consent may be sought where legally and ethically required. ○ Clearly communicate the purposes of monitoring. • Security and Compliance: ○ Outline in the Code of Conduct that monitoring is essential for maintaining network security, compliance with policies, and protection against potential threats. ○ Emphasise the role of employees in contributing to a secure work environment. • Acceptable Use Policy: ○ Clearly include the acceptable use policies in the Code of Conduct, explaining that monitoring activities aim to enforce these policies. • Training and Awareness: ○ Include a plan and details within the Code of Conduct for ongoing training and awareness programs to educate employees about the importance of responsible network usage, the reasons for monitoring.	6			

Band	AO1 Max 6 Marks
3	5-6 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	3-4 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	1-2 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.

Q	Answer	AO1	AO2	AO3	Total
12	A binary tree needs to be created by inserting the following fruits in sequence: Pineapple, Strawberry, Lemon, Melon, Pomegranate and Apple.				
(a)	Construct a binary tree using the following rules: - The left pointer indicates the condition “earlier or at the same position in the alphabet”. - The right pointer indicates the condition “later in the alphabet”. You can abbreviate the fruit names if you wish.				2
	 Award 1 mark for correct root node Award 1 mark for correct structure		1 1		
(b)	Carry out an in-order traversal of the tree				1
	Apple, Lemon, Melon, Pineapple, Pomegranate, Strawberry Award 1 mark for correct order		1		
(c)	Carry out a pre-order traversal of the tree				1
	Pineapple, Lemon, Apple, Melon, Strawberry, Pomegranate Award 1 mark for correct order		1		
(d)	Carry out a post-order traversal of the tree				1
	Apple, Melon, Lemon, Pomegranate, Strawberry, Pineapple Award 1 mark for correct order		1		

Q	Answer	AO1	AO2	AO3	Total
13	Describe in detail the features of the following programming paradigms and identify possible situations that they might be used. • Procedural languages • Object-oriented languages • Specific purpose languages				12
	Indicative Content Procedural Languages • Procedural languages are those that solve a problem in a linear fashion through a sequence of step-by-step instructions and involve the use of selection, iteration and callable procedures. • Procedural programming supports a logical step-by-step process such as implementing an algorithm. • Procedural languages organise code into procedures or functions that carry out specific tasks. • Procedural programming follows a top down approach. • Allows the programmer to define precisely each step when performing a task. • Provides close control over the underlying operation of the hardware • Programs are divided into functions. • Procedural programming relies of the use of iteration, sequence and section. • Procedures act on data, and there is a clear separation between data and the procedures that manipulate it. • Code is modular, making it easier to understand, maintain, and reuse. Uses • Examples of Procedural Languages include Pascal and C. • Procedural languages are more suited to problems that require a linear algorithm solution. • Procedural languages like C are often used for system-level programming due to their close relationship with hardware. • Procedural languages are suitable for algorithmic problem-solving where step-by-step execution is important. • In situations where low-level control over hardware and memory is required, procedural languages are commonly used. • Procedural programming could be use the development of command line interface software applications.	12			

Q	Answer	AO1	AO2	AO3	Total
	Object-Oriented Languages • Object orientated programs are divided into objects, classes and methods. • Classes define the blueprint for objects. • Can use inheritance to reduce code duplication and flexibility. • Inheritance enables the creation of new classes based on existing classes. • Allows data to be encapsulated making data more secure. • Data and methods are encapsulated providing a clear interface for interaction. • Abstracts complex systems by modelling entities as objects with defined behaviours. • Easier to expand programs and multiple developers can work on one project without affecting each other's code. Uses • Examples of OOP are C++ and Java. • Object orientated programming could be use the development of a large-scale distributed software application that requires a large team of developers. • GUI applications benefit from the encapsulation and abstraction features of object-oriented languages. Systems that require user interface development. • OOP are suitable for modelling real-world entities making it suitable for simulations and games. Specific Purpose Languages • Special-purpose language is a programming language designed to solve a finite class of problems. • Often comes with specialised libraries and frameworks tailored to the specific domain or task. • Provides high-level abstractions to simplify complex tasks within the targeted domain. • Syntax is often optimised for expressing concepts within the specialised domain. • Includes built-in functions and tools specific to the problem it aims to solve. Uses • Machine Learning and Data Analysis - Languages like Python with libraries such as TensorFlow and scikit-learn are used for machine learning and data analysis tasks. • Expert Systems - Prolog, a logic programming language, is commonly used in the development of expert systems and AI. • SQL is used to manipulate databases • Scientific Computing - MATLAB is often used in scientific computing for its specialised functions and toolboxes.				

Band	AO1
4	10 - 12 marks An excellent description, which shows: - thorough knowledge and understanding of the features of the following programming paradigms. - a confident grasp of where these programming paradigms might be used. - Clear knowledge is defined as responses that provide relevant detailed points of the indicative content, 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. - 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.
3	6 – 9 marks A good description, which shows: - generally secure knowledge and understanding of the features of the following programming paradigms. - a generally secure grasp of where these programming paradigms might be used. - A generally secure knowledge is defined as responses that provide relevant points of the indicative content, which relate to the indicative content. - presented a discussion with some examples. - drawn together different areas of knowledge, skills and understanding from a number of areas across the course of study. - used appropriate technical terminology
2	3 – 5 marks A basic description, which shows: - some knowledge and understanding of the features of the following programming paradigms. - some grasp of the different features of where these programming paradigms might be used. - satisfactory knowledge is defined as responses that provide relevant points of the indicative content, which relate to the indicative content. - presented a discussion with limited examples. - drawn together different areas of knowledge, skills and understanding from a some areas across the course of study. - used some appropriate technical terminology
1	1 - 2 marks A limited description, which shows: - little knowledge and understanding of the features of the following programming paradigms. - little grasp of the different features of where these programming paradigms might be used. - attempted to address the question but has demonstrated superficial knowledge of the topics specified in the indicative content. - superficial knowledge is defined as responses that provide limited relevant points of the indicative content, which relate to a limited amount the indicative content. - used limited technical terminology.
	0 marks Response not creditworthy or not attempted.