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GCE

Computer Science

H446/01: Computer systems

A Level

Mark Scheme for June 2024

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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PREPARATION FOR MARKING
RM assessor

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to RM assessor and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the RM assessor 50% and 100% (deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM assessor messaging system, or by email.

5. **Crossed Out Responses**
   Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

   Contradictory Responses
   When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

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Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
   - there is nothing written in the answer space

   Award Zero '0' if:

   - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your team leader, use the phone, the RM assessor messaging system, or e-mail.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

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To determine the level – start at the highest level and work down until you reach the level that matches the answer
To determine the mark within the level, consider the following:

Descriptor	**Award mark**
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. **Annotations**

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Annotation	Meaning
	Omission mark
	Benefit of the doubt
	Subordinate clause / consequential error
	Incorrect point
	Expansion of a point
	Follow through
	Not answered question
	No benefit of doubt given
	Point being made
	Repeat
	Correct point
	Too vague
	Zero (big)
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	Level 1
	Level 2
	Level 3

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12. Levels of Response Questions

The indicative content indicates the expected parameters for candidates' answers but be prepared to recognise and credit unexpected approaches where they show relevance.

Using 'best-fit', decide first which set of BAND DESCRIPTORS best describes the overall quality of the answer. Once the band is located, adjust the mark concentrating on features of the answer which make it stronger or weaker following the guidelines for refinement.

• **Highest mark:** If clear evidence of all the qualities in the band descriptors is shown, the HIGHEST Mark should be awarded.

• **Lowest mark:** If the answer shows the candidate to be borderline (i.e. they have achieved all the qualities of the bands below and show limited evidence of meeting the criteria of the band in question) the LOWEST mark should be awarded.

• **Middle mark:** This mark should be used for candidates who are secure in the band. They are not 'borderline' but they have only achieved some of the qualities in the band descriptors.

Be prepared to use the full range of marks. Do not reserve (e.g.) high Band 3 marks 'in case' something turns up of a quality you have not yet seen. If an answer gives clear evidence of the qualities described in the band descriptors, reward appropriately.

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	AO1	AO2	AO3
High (thorough)	Precision in the use of question terminology. Knowledge shown is consistent and well-developed. Clear appreciation of the question from a range of different perspectives making extensive use of acquired knowledge and understanding.	Knowledge and understanding shown is consistently applied to context enabling a logical and sustained argument to develop. Examples used enhance rather than detract from response.	Concerted effort is made to consider all aspects of a system / problem or weigh up both sides to an argument before forming an overall conclusion. Judgements made are based on appropriate and concise arguments that have been developed in response resulting in them being both supported and realistic.
Middle (reasonable)	Awareness of the meaning of the terms in the question. Knowledge is sound and effectively demonstrated. Demands of question understood although at times opportunities to make use of acquired knowledge and understanding not always taken.	Knowledge and understanding applied to context. Whilst clear evidence that an argument builds and develops through response there are times when opportunities are missed to use an example or relate an aspect of knowledge or understanding to the context provided.	There is a reasonable attempt to reach a conclusion considering aspects of a system / problem or weighing up both sides of an argument. However the impact of the conclusion is often lessened by a lack of supported judgements which accompany it. This inability to build on and develop lines of argument as developed in the response can detract from the overall quality of the response.
Low (basic)	Confusion and inability to deconstruct terminology as used in the question. Knowledge partial and superficial. Focus on question narrow and often one-dimensional.	Inability to apply knowledge and understanding in any sustained way to context resulting in tenuous and unsupported statements being made. Examples if used are for the most part irrelevant and unsubstantiated.	Little or no attempt to prioritise or weigh up factors during course of answer. Conclusion is often dislocated from response and any judgements lack substance due in part to the basic level of argument that has been demonstrated throughout response.

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Question			Answer	Mark	Guidance
1	(a)		1 mark per bullet to max 4: ● The **contents** of the Program Counter/PC are **copied/sent** to the Memory Address Register/ MAR ● The address is **sent/transferred** along the address bus ● The control unit **sends/transfers** a (read) signal along the control bus ● Contents stored in the memory address are **sent/transferred** along the data bus ● Contents (from memory) are stored in the Memory Data Register/MDR ● …and **sent/copied to** the Current Instruction Register/ CIR ● The Program Counter/PC is incremented	4	Accept IR/Instruction Register for CIR/Current instruction Register Accept MBR/Memory Buffer Register for MDR/Memory Data Register
1	(b)		● Program Counter // PC	1	
1	(c)		1 mark per bullet: ● Allows the next instruction to be fetched **whilst** the previous one is being decoded/executed // allows the overlapping of different parts of the FDE ● It **increases** throughput // **increases** the number of **instructions** processed **in a set period of time** ● It prevents the CPU having to wait // prevents idle components	3	DNA responses that talk about the FDE running **faster**. Allow a diagram demonstrating pipelining for MP1. Allow 'it will take less time to do the same amount of instructions' for MP2 BOD 'processes' for 'instructions' for MP2. DNA 'more efficient' on its own for MP2 DNA points if clearly discussing multiple cores.

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1	**(d)**	**(i)**	1 mark per bullet to max 3: • 0 • 1, 2, 4 • 8 with no numbers after it	3	CAO
1	**(d)**	**(ii)**	1 mark for each correct line. START LDA MAX BRZ END LDA A OUT **LDA B** STA TEMP **LDA A** ADD B STA B **LDA TEMP** STA A LDA MAX SUB ONE STA MAX BRA START END HLT A DAT 0 B DAT 1 **TEMP** DAT 0 MAX DAT 5 ONE DAT 1	4	CAO Case for mnemonics can be ignored. Case for A, B, TEMP must be all caps. Penalise first error and allow FT.
1	**(e)**		1 mark per bullet to max 3: • Immediate • Indirect • Indexed	3	DNA direct BOD 'index' for MP3

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1	**(f)**		1 mark per bullet to max 2: ● **Quicker/more efficient** to <u>translate</u> ● Makes more efficient use of the CPU // memory // system resources // where a system may have limited resources ● The programmer wants direct control over hardware/memory // to access machine specific functionality ● Code might be written for a specific architecture ● Compilers/interpreters may not be available	2	MP1 must be a comparison e.g. faster/quicker not just fast/quick
1	**(g)**		1 mark per bullet to max 3: ● Allows **more active/running/temporary** data in RAM ● It reduces the need to use virtual memory ● RAM is faster to access than VM/secondary storage… ● ...because **data** in VM/SS has to be swapped with **data** in RAM first ● Use of RAM rather than VM reduces the risk of disk thrashing ● Faster bootup/ shutdown time // reduces load/access time	3	MP1 must imply more/larger amount of data Allow 'instructions/programs/apps/processes/tasks' for data. MP2 - BOD 'no need for Virtual Memory'.

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Question			Answer	Mark	Guidance
2	(a)		1 mark max for input device and 1 mark max for reason: ● Heart rate sensor ● Detects athlete's electrical activity / heart rate ● GPS (receiver) ● Mapping the athlete's **movement / position/ speed** ● Accelerometer/gyroscope/motion sensor ● To track the players acceleration/speed/movement/ counting steps/measuring orientation ● Button ● To allow the athlete to turn it on/off	2	Allow other suitable input devices as long as they are suitable for the scenario and an input device e.g. thermometers, light and UV sensors, skin response sensors, magnetometers, gyrometer, ECG No FT for use if incorrect device Use must be related to the fitness tracker scenario
2	(b)		1 mark for reason and 1 mark for expansion up to a maximum of 4 marks. ● Durable/flash has no moving parts… ● …so will be resistant to damage if the player runs/falls/collides with something ● Low power usage… ● …won't need recharging/will last during an event ● Small **physical size**/portable… ● …so it can fit on a shirt/be unobtrusive/be worn // won't affect the athlete's performance ● Fast/real-time read/write speed… ● …needed to rapidly record athlete's data	4	Mark across whole answer space Expansion must relate to scenario DNA 'small' on its own DNA anything to do with capacity

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Question			Answer	Mark	Guidance
2	(c)	(i)	1 mark per bullet to max 3: ● Contains the computer start up instructions ● Loads **settings/configuration** (CMOS/NVRAM) ● Initialises/checks hardware/peripheral devices are available/work // carry out a POST check… ● …and **reports** errors ● Determines the drive on which the OS is stored ● Finds/loads the bootstrap/operating system/kernel (into main memory)	3	DNA 'boots up' on its own
2	(c)	(ii)	Mark from one group to max 2: ● Storing firmware/ config/ operation instructions/ operating system/ device drivers… ● …that can't be overwritten // doesn't need to be updated ● …so that access is faster OR ● Storing security settings/encryption keys/digital signatures… ● …that must be maintained/can't be changed OR ● Could be used as primary storage… ● …so no need to load programs into memory ● …so would save time loading up the program OR ● Could be used as secondary storage… ● ….so the device will not need additional storage… ● ….to reduce the size of the device	2	

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Question			Answer	Mark	Guidance
2	(d)	(i)	2 marks from each group to max 4: ● Resource/memory management e.g. ● Moving data between RAM and secondary storage/ virtual memory // paging and/or segmentation ● Allocating/deallocating memory ● Manage hardware/peripherals e.g. ● Tracking all devices connected to the system ● Device drivers ● File management e.g. ● Storing files in secondary storage ● Searching for //copying // moving // renaming files/folders ● Security/user management e.g. ● Controlling who can access the system //Managing user profiles ● Controlling who can access certain resources on the system // Managing access rights ● Provide a user interface e.g. ● Allowing the user to interact with the software/hardware/computer ● Providing utilities e.g. ● Used to monitor // manage // maintain the computer ● To manage the security ● Providing a platform on which to run software e.g. ● Allows additional software to be installed on the computer ● To allow the user to complete additional tasks	4	DNA handle interrupts or manage scheduling. Allow any reasonable description that matches with the role. Mark in groups.

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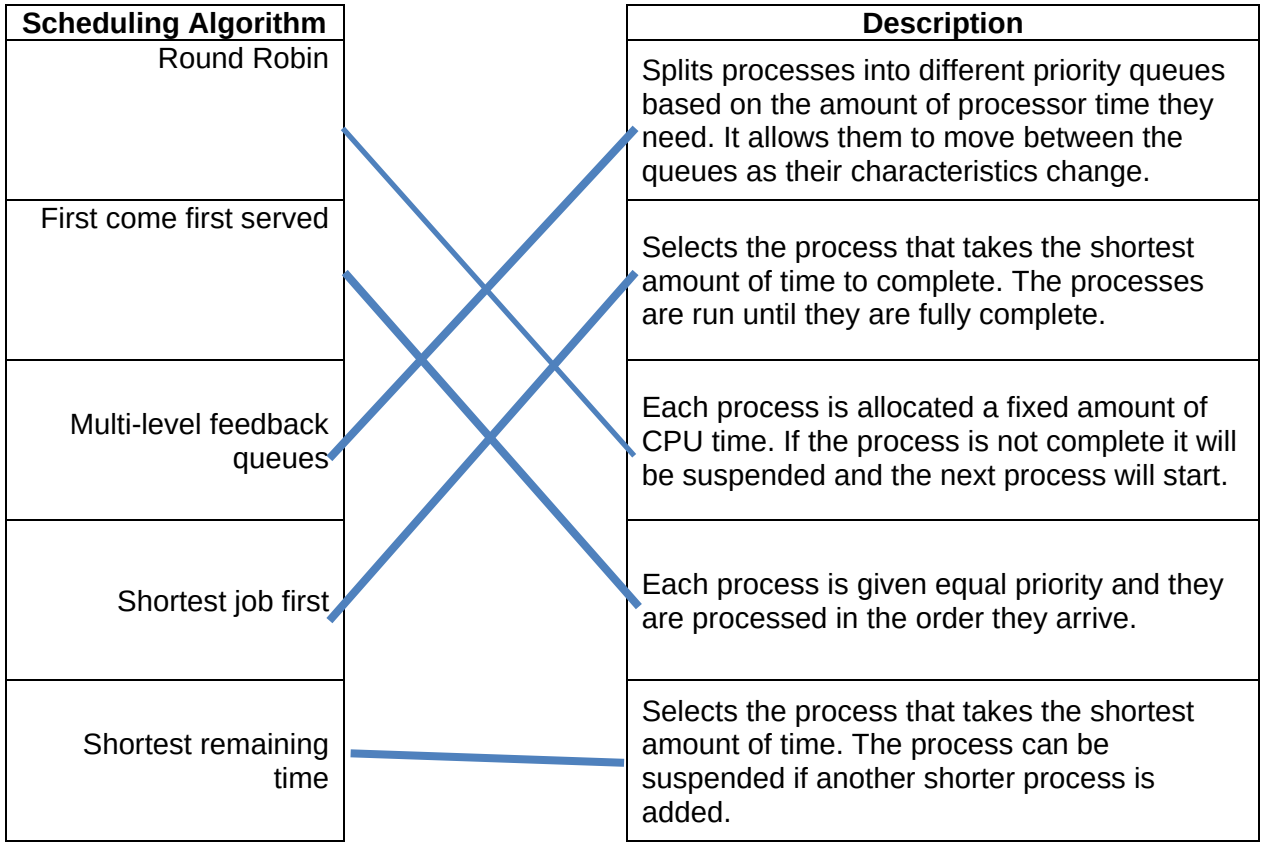
2	**(d)**	**(ii)**	1 mark for each correct match. 	5	

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2	**(e)**		**Mark Band 3–High Level (7-9 marks)** The candidate demonstrates a thorough knowledge and understanding of each of the cultural issues. The material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. *A mark band 3 answer will cover all three points relating to layout, colour and character sets and the cultural impacts of these on the design of the program. The examples will be relevant to the pitch-side program and the needs of the athletes and will go on to evaluate why it is important to ensure these considerations are made.* **Mark Band 2-Mid Level (4-6 marks)** The candidate demonstrates reasonable knowledge and understanding of most cultural issues; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.	9	Points may include but **aren't limited to**: **AO1 Knowledge and Understanding** Accessibility, colour blindness etc are not relevant to context. Cultural issues are about how different groups of people with particular beliefs, practices or languages may be affected by something. The layout is an important factor to consider. This will determine where items will be placed on the screen. Where items are placed on the screen can massively impact how easily people can use them. The layout which is suitable for one country may not be suitable for another. Colour should be carefully considered. Humans have their own personal perception of different colours and will use this to determine what it means. Colour can be used to confirm messages to the audience, e.g. if our interactions with the software has been successful or not. However, colours can mean different things in different cultures. A character set is a list of characters that can be recognised by the hardware and software. There are various different character sets such as ASCII and UNICODE. **AO2 Application** Western audiences will often read from left to right and top to bottom. However, other countries around the world read from right to left. Athletes are from around the world and this needs to be considered. Traditionally, green often indicates that something is positive or that an interaction with the computer has been successful. Red often indicates something negative or that an interaction with the computer has not been successful. However, these colours

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			A mark band 2 answer will cover at least two of layout, colour and character sets and will expand the points, relating these to cultural considerations, the pitch-side program and/or the needs of the athletes although these may not be balanced. **Mark Band 1-Low Level (1-3 marks)** The candidate demonstrates a basic knowledge of some cultural issues; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear. *A mark band 1 answer will contain some basic, relevant points related to layout, colour and/or character sets. It may not be linked to cultural considerations or the context of the pitch-side program or athlete's needs.* **0 marks** No attempt to answer the question or response is not worthy of credit.		may have different meanings and could be seen as offensive in different cultures. Designers therefore need to ensure they don't offend any particular culture as the app is for international athletes. There are many different character sets. The ASCII character set can only represent 128/256 characters which would be suitable for English and European languages. However, this would not be a suitable character set for other world-wide languages and if used, it would mean that characters could not be displayed which would affect the athletes' use of the app. **AO3 Evaluation** As the software is being used by different cultures, it is important that the user interface can be used and understood by all audiences otherwise people may choose not to use the fitness trackers e.g. using icons rather than words could be more universally understood by the athletes. The programmer needs to consider the typical layout, colours and characters used in different cultures and ensure these are taken into consideration to ensure that groups of people are not offended and will still understand the words, data and charts. Designers could release different versions of the software for different parts of the world or make sure the program has the ability for settings to be changed to overcome any potential issues and allow the athletes to customise their experience.

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>1 mark for each correct application software
<table>
<tr><th>Task</th><th>Application Software</th></tr>
<tr><td>Creating graphics such as a logo</td><td>Graphics/image editing software</td></tr>
<tr><td>Writing letters to clients to confirm their appointment date and time.</td><td>Word processing software</td></tr>
<tr><td>Calculating the company profits at the end of each month.</td><td>Spreadsheet/ Accounting software</td></tr>
<tr><td>Storing, searching and updating client details and purchases.</td><td>Database software</td></tr>
<tr><td>Creating brochures and flyers about the organisation.</td><td>Desktop publishing software // DTP</td></tr>
</table></td><td>5</td><td>Allow any sensible software.
e.g. text editor for WP
e.g. photo/image editor for row 1

BOD publication editor for DTP

DNA brand names - ignore brand name if application type is also given.</td></tr>
<tr><td>3</td><td>(b)</td><td></td><td>1 mark for:
Reduced hardware is needed on computers // reduced hardware costs
Improved security by keeping all software running from one physical device
Easier/cheaper to manage as only one physical device runs the programs.
Can add/remove resources/memory/processes to the VM
If it is infected by malware it can be deleted and recreated // the rest of the system isn’t affected/is protected against malware
No direct access to hardware
Resources can be used more flexibly between the machines</td><td>1</td><td></td></tr>
</table>

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Question			Answer	Mark	Guidance
3	**(c)**		1 mark per bullet to max 3: ● Lossless will not **permanently** remove data ● Lossless can be fully reconstructed/restored ● Quality (of text/graphics/sound) is not lost ● Any loss of text would be noticeable/would make it unreadable/unusable ● Lossless rewrites data in a more efficient format	3	Accept reverse points e.g. lossy will delete data **permanently**
3	**(d)**	**i**	1 mark per bullet to max 2: ● Combines/links code/programs to files/software libraries… ● …to form a single executable file	2	Allow one mark for valid description of static and/or dynamic linkers e.g. Static linkers combine code and libraries into one file // Dynamic linkers link/add addresses to libraries
3	**(d)**	**ii**	1 mark per bullet to max 2: ● It is part of the operating system ● Loads an executable file (into memory)... ● …from secondary storage ● Loads the required software libraries	2	MP2 - Allow loads applications/programs

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Question			Answer	Mark	Guidance
4	(a)	i	1000 0100	1	CAO
		ii	Sign and magnitude	1	Accept: One's complement
4	(b)		12A ● 1 mark for 12 ● 1 mark for A	2	Must be in correct order.
4	(c)		1 mark per bullet to max 3: ● Converting exponent to **6** ● Converting mantissa to **1001110.1** // moving binary point **6** to the **right** ● **-49.5**	3	MP2 - if flipped = **110001.1** Correct answer, with any binary working gets full marks
4	(d)		1 mark per bullet to max 4: ● Reducing exponent **to 4** // reducing exponent **by 3** ● New mantissa starts **01011**… ● … and is written out to 8 bits making **01011000** ● New exponent of **0100**	4	Correct mantissa and exponent, with any binary working gets full marks
4	(e)		1 mark per bullet to max 2: ● 1101 0000 ● Correct working out/ 6 carries shown	2	0 marks for denary calculations with no carries shown.

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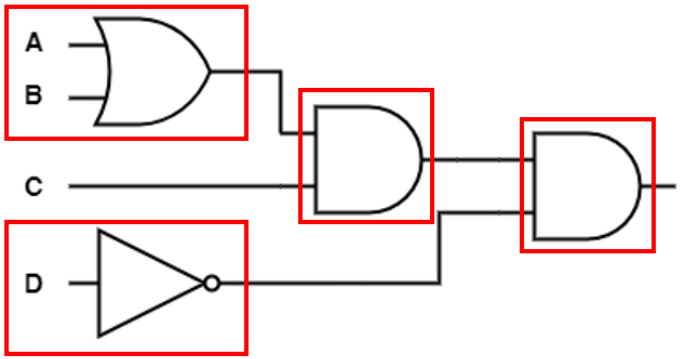
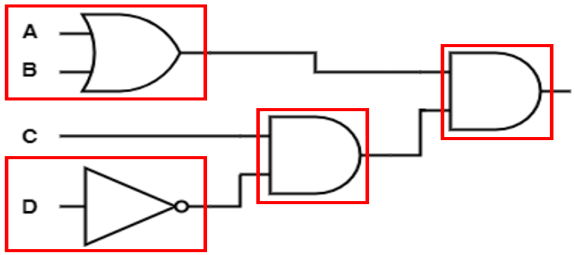
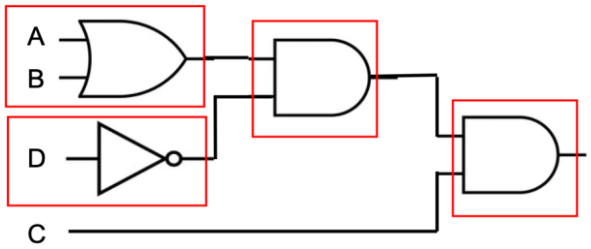
Question			Answer	Mark	Guidance
5	(a)	(i)	1 mark for each correct area **including labelled inputs**  **Alternatives (1 mark per area):**   	4	Max 3 if any additional gates. NOT gate must have only one input, AND/OR gates must have two inputs NOT gate must have circle Ignore any names on gates

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Question			Answer	Mark	Guidance
5	(b)	(i)	¬ (A ∧ B)	1	Accept NOT (A AND B) / other correct notations e.g. $\overline{A.B}$ ¬ must be the correct way round
		(ii)	B	1	
		(iii)	• 1 mark for A • 1 mark for v (B ∧ C) A v (B ∧ C)	2	Doesn't need brackets Allow other correct notation e.g. A+B.C Allow either order e.g. (B^C) v A Allow Av(BC) / AvBC

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Question			Answer	Mark	Guidance
6	(a)		**Mark Band 3–High Level (9-12 marks)** The candidate demonstrates a thorough knowledge and understanding of search indexing and page rank. The material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to assess the extent to which page rank and search engine optimization is important to online visibility. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. *A mark band 3 answer will explain in detail how search indexing happens and the factors affecting PageRank scores. There will be clear evaluative points that identify how to improve PageRank score.* **Mark Band 2-Mid Level (5-8 marks)** The candidate demonstrates reasonable knowledge and understanding of search indexing and page rank; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.	12	Points may include but aren't limited to: **AO1 Knowledge and Understanding** Search engine indexing: ● Search engine indexing is where a database of key words is kept with links to relevant pages stored with the keyword ● Words are stored along with their position on a page ● Bots (spider/crawlers) will "crawl" the web finding web pages and looking for key words on them ● The will navigate from page to page following hyperlinks ● They are then sent back to the search engine's database ● When you search for a website, you are not searching on the web, you are searching in the search providers database PageRank: ● Used to find and rank website pages and then list the results in a search engine. If a website has a higher score, it will appear higher in the list of search results. ● More links from more important pages, ranks a page higher ● Stored as a weighted, directed graph ○ Pages are nodes ○ Hyperlinks are edges in one direction ○ Weightings are calculated by page rank **AO2 Application**

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			The candidate makes a reasonable attempt to come to a conclusion as to why page rank and search engine optimisation are important to online visibility. There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence. *A mark band 2 answer will cover both search indexing and page ranking and will expand the points, explaining what information is collected during indexing and factors that affect PageRank scores although these may not be balanced. There should be some attempt to identify how to improve PageRank score.* **Mark Band 1-Low Level (1-4 marks)** The candidate demonstrates a basic knowledge of search indexing or page rank; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear. *A mark band 1 answer will contain some basic, relevant facts about what search indexing is and/or what PageRank means. They may not discuss how the company can improve PageRank.* **0 marks**		To get more of presence they will need to… ● Make effective use of meta tags that effectively describe the contents of the website. ● Make effective use of H1 tags using suitable headings that describes the content of the website ● Increase the number of quality of incoming links from other websites, ideally those with a high PageRank score themselves ● Increase the number of outgoing links ● Key words can be stored in meta tags, title tags or header tags (h1, h2 etc) ● Damping factor is used to quash a PageRank based on the idea that a user will only click through a certain number of links **AO3 Evaluation** ● PageRank algorithm is only one algorithm that is used to Rank websites. ● To get a better presence on the internet, the company will need to consider who links to their page, the more popular the better ● They could potentially work with other companies who have established websites and get incoming links from those sites ● It's important that a company ensures their site is malware free/secure as this can impact on their PageRank score

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			No attempt to answer the question or response is not worthy of credit.		

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>6</td><td>b</td><td></td><td>1 mark for each correct row.
<table>
<tr><th>Task</th><th>Client Side</th><th>Server Side</th></tr>
<tr><td>Loading the website HTML code.</td><td>✓</td><td></td></tr>
<tr><td>Applying CSS styles to a website.</td><td>✓</td><td></td></tr>
<tr><td>Running JavaScript code to check that the customer surname has been entered on the order form.</td><td>✓</td><td></td></tr>
<tr><td>Running queries on the database to check if an item is available in stock.</td><td></td><td>✓</td></tr>
</table></td><td>4</td><td>Accept alternatives to ticks in the boxes so long as it is clear which side is marked.</td></tr>
<tr><td>6</td><td>(c)</td><td></td><td>1 mark per bullet to max 2:

1 mark for:
● A set of rules for communication/ transmission/transfer of data between devices

1 mark max from:
● The sending system has no direct control over the way the receiving system responds
● Allows standardisation as different devices have different OS/hardware
● Protocols allow for data to be exchanged in a predictable way/ in the correct format</td><td>2</td><td>Not ‘a rule’ - must be plural

MP1 not a set of instructions

MP1 accept standards / an agreement</td></tr>
<tr><td>6</td><td>(d)</td><td></td><td>1 mark for hardware and 1 mark for expansion to 6 marks max

● Router e.g.</td><td>6</td><td>2 marks max each.

Allow any suitable expansion.</td></tr>
</table>

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Question			Answer	Mark	Guidance
			• Connect networks together • Assign IP address to devices • Examines data packets and forwards them • **Cable/ Ethernet** e.g. • Carries digital data from one device/NIC to the next • Connects wired devices to the network • **Gateway** e.g. • Connects different types of network • Translates protocols from one network to another • **Bridge** e.g. • Connects different network segments • **Repeater** • Receives a signal and retransmits it • **Network Interface Card // NIC** e.g. • Gives each device a MAC address / unique ID • Allows a computer system to interface with a network • **Wireless Access Point // WAP** e.g. • Allows wireless devices to communicate with each other • Sends and receives radio waves • Examines data packets and forwards them • **Switch** e.g. • Connects multiple wired devices to the network • Receives data and forwards it to the intended recipient		Mark in pairs. Allow: **Proxy server** e.g. • Sits between user and computer to route requests through an external server • Creates separation between a user and the site/service • Protects your security/anonymity by hiding IPs

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Question			Answer	Mark	Guidance
			● Examines data packets and forwards them ● Routes based on MAC addresses ● **Hub** e.g. ● Receives data from a device and broadcasts it to **all** devices connected to it ● **Modem** e.g. ● Changes a signal from digital to analogue ● **Firewall** e.g. ● Filters traffic coming in and out of a network		

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7			**Mark Band 3–High Level (7-9 marks)** The candidate demonstrates a thorough knowledge and understanding of databases. The material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. *A mark band 3 answer will cover benefits and disadvantages of both flat file and relational databases. The expansions will relate to Rosa's needs and will go on to evaluate why a relational database is most appropriate.* **Mark Band 2-Mid Level (4-6 marks)** The candidate demonstrates reasonable knowledge and understanding of databases; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.	9	Points may include but aren't limited to: **AO1 Knowledge and Understanding** A flat file database stores data in a single table, often in a plain text file. Usually, each line will hold a single record and delimiters such as commas are used to separate this into different fields. **Benefits:** ● They are easy to set up as only one table is needed ● All records are stored in one place **Drawbacks:** ● Tables can contain lots of redundant data which increases the amount of storage space needed ● Searching the database can be slower as there is more data to search ● The database can be more difficult to manage and possibly expand in the future A relational database stores data in multiple different tables. These are linked together using relationships created by primary and foreign keys. **Benefits:** ● There is less duplication of information so less redundant data which can reduce the file size ● The database is easier to manage and easier to expand in the future ● Searching the database may be faster as there is less data / not all tables need to be searched ● It can be more secure as different tables means different people could have different access

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			A mark band 2 answer will cover features of both flat file and relational databases and will expand the points, relating these to benefits and drawbacks and size of Rosa's data set although these may not be balanced. There will be an attempt to recommend which type is suitable. **Mark Band 1-Low Level (1-3 marks)** The candidate demonstrates a basic knowledge of databases; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear. *A mark band 1 answer will contain some basic, relevant points related to features of flat file and/or relational databases. It may not be linked to Rosa's specific needs.* **0 marks** No attempt to answer the question or response is not worthy of credit.		**Drawbacks:** ● They are generally more difficult to set up and need more technical knowledge to do things like normalisation. ● Data is spread out between multiple tables. Some tables may be link tables which only display key fields / references ● They are more expensive as you will need a DBMS rather than just a basic file **AO2 Application** ● Given that Rosa currently has 150 members, a flat file database will be suitable ● However, as the business expands, using a flat file database may prove problematic ● She could end up with a lot of redundant data as each time a new booking/appointment is made, it may store repeated data. ● The more data Rosa has, the more likely there could be inconsistencies if data is edited/updated and her data would lose integrity ● A relational database would be more efficient. ● Membership details can be stored once and then their membership ID number can then be used to make a booking ● A relational database will also allow her to expand even further in the future as additional tables can be added. However, the database will need to be normalised to ensure data is consistent, in the same format and that dependencies are reduced **AO3 Evaluation** The most suitable database for Rosa would be a relational database. Although this is more complex and

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					the data needs to be normalised, it will store less repeated data when her company expands. It will also allow the database to be easily maintained and expanded in the future and will be easier to keep data secure, which is important.

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td>(i)</td><td>

Typed as array/string and set to the variable <code>towns</code>
2 dimensions set to 8 and 3 in brackets

Examples
<code>array towns(8,3)</code>
<code>string towns[][] = new string [8][3]</code>
<code>array towns [8][3] as string</code>
</td><td>2</td><td>For MP1 accept any suitable attempt at typing as an array, for example <code>towns = [], towns( )</code>

For MP2 accept any suitable attempt to set to 2 dimensions of the correct size

Allow 7, 2 as array index

Allow column major notation
i.e. <code>array towns [3,8]</code></td></tr>
<tr><td>8</td><td>(b)</td><td>(i)</td><td>
<table>
<tr><th></th><th>Left</th><th>Data</th><th>Right</th><th>Marking Guidance</th></tr>
<tr><td>0</td><td>1</td><td>Sligo</td><td>3</td><td rowspan="2">1 Mark</td></tr>
<tr><td>1</td><td>2</td><td>Dublin</td><td>4</td></tr>
<tr><td>2</td><td>null</td><td>Cork</td><td>null</td><td rowspan="2">1 Mark</td></tr>
<tr><td>3</td><td>6</td><td>Waterford</td><td>null</td></tr>
<tr><td>4</td><td>7</td><td>Galway</td><td>5</td><td rowspan="2">1 Mark</td></tr>
<tr><td>5</td><td>null</td><td>Limerick</td><td>null</td></tr>
<tr><td>6</td><td>null</td><td>Tralee</td><td>null</td><td rowspan="2">1 Mark</td></tr>
<tr><td>7</td><td>null</td><td>Dundalk</td><td>null</td></tr>
</table>
</td><td>4</td><td>Allow -1 or Ø for <code>null</code>

FT for 0/blank used as null after first error.</td></tr>
<tr><td>8</td><td>(b)</td><td>(ii)</td><td>1 mark for each correct town.</td><td>4</td><td>If same town added more than once BOD if one in the right place</td></tr>
</table>

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			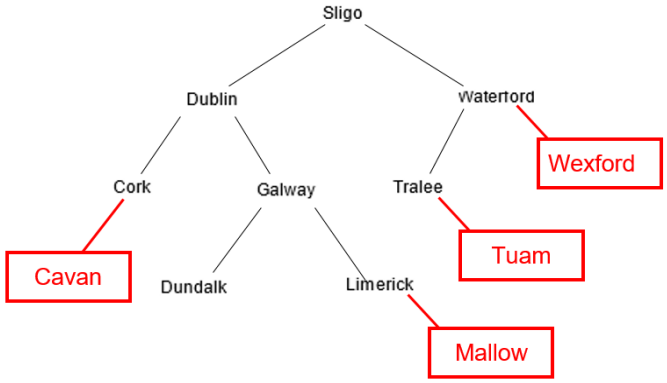		Ignore basic spelling mistakes and case Towns must be to left or right of the node above - DNA nodes straight below.

9			1 mark per bullet to max 5:
			• Suitable logic for class dog declaration
			• Suitable logic to define the 4 (private) attributes: **`name, breed, height, weight`**
			• Suitable logic to declare a <u>public</u> method for constructor (e.g. new or class name)…
			• ….taking <u>only</u> 4 different parameters in any order.
			• Suitable logic to set the values of each attribute
			
			MP4 - if it is obvious the candidate has used Pythonic syntax: allow the additional 5th parameter representing the object e.g. `self, turtle` <u>but this must be the **first** parameter listed.</u>
			
			MP2 - If they have done the above BP2 can be considered implicitly met (Python doesn't require attributes to be declared outside the constructor)
				5	Mark in a vertical line against each MP.
					
					Ignore data types in attribute names
					
					Allow colon/empty brackets at the end of class def
					
					Example Solutions
					<u>Pseudocode style</u>
					`class Dog`
					`  private name`
					`  private breed`
					`  private height`
					`  private weight`
					
					`  public procedure new (nameIn, breedIn, heightIn, weightIn)`
					`  name = nameIn`
					`  breed = breedIn`
					`  height = heightIn`
					`  weight = weightIn`
					`endclass`
					
					<u>Java / C# Style</u>
					`Class Dog`

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```
{
   private String name
   private String breed
   private float height
   private float weight

   public void Dog(String name, String
    breed, float height, float weight)
   {
      this.name = name
      this.breed = breed
      this.height = height
      this.weight = weight
   }
}
```

Python Style

```
class Dog:
   def __init__(self, name, breed,
height, weight):
      self.name = name
      self.breed = breed
      self.height = height
      self.weight = weight
```

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Question			Answer	Mark	Guidance
10	a		1 mark per bullet to max 3: ● Allows for mass surveillance of communications ● Allows the **monitoring** of an individual's internet activities/history ● Allows covert surveillance to be carried out ● Can demand access to protected data ● Can demand that ISPs/businesses give access to customer communications/history ● Can demand that ISPs/businesses install equipment that facilitate surveillance ● Can demand that encryption keys are handed over // force individuals to decrypt data ● Can keep existence of searches and what found private in court	3	Allow other suitable answers relating to examples of other types of surveillance e.g. CCTV, directed surveillance. MP4 relates to password protected data or accessing data protected under the DPA
10	b		1 mark per bullet to max 3: ● Data must be processed **fairly/ lawfully** ● Data must be **adequate/ relevant/ not excessive** ● Data must be **accurate** and (where necessary) **up to date** ● Data must **not be retained for longer than necessary** ● Data can only be **used for the purpose** for which it was collected ● Data must be **kept secure** ● Data must be **processed in accordance with people's rights** ● Data must not be transferred outside of the EU without adequate protection // to other countries who do not have equivalent data protection laws	3	Accept: Right to see their own data/change if incorrect

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