



2014 Computing

Higher

Finalised Marking Instructions

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Part One: General Marking Principles for Computing Higher

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

- (a)** Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor. *You can do this by posting a question on the Marking Team forum or by e-mailing/phoning the e-marker Helpline.*
- (b)** Marking should always be positive i.e., marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE: Computing Higher

The marking schemes are written to assist in determining the “minimal acceptable answer” rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates’ evidence, and apply to marking both end of unit assessments and course assessments.

Part Two: Marking Instructions for each Question

SECTION I

Question		Expected Answer(s)	Max Mark	Additional Guidance
1.		-50	1 PS	
2.		<ul style="list-style-type: none"> Unicode can represent a wider range of characters (sets) than ASCII. Unicode uses 16 bits per character allowing for representation of more character sets. Unicode allows for user-defined characters whereas ASCII does not. <p>Any bullet for a maximum of 1 mark.</p>	1 KU	Not 'more languages' unless mentioned as a consequence of supporting more character sets. Be aware that Unicode can also use 32bits.
3.		<ul style="list-style-type: none"> Start X / X1 Start Y / Y1 Finish X / X2 Finish Y / Y2 (Line) thickness/stroke-width (Line) colour (Line) pattern Any other valid <p>1 mark for each bullet for a maximum of 2 marks.</p>	2 PS	Do not accept Fill or Fill colour.
4.		<ul style="list-style-type: none"> Hold data (to be processed). Hold an address (to be accessed). Any other valid. <p>Either bullet for a maximum of 1 mark.</p>	1 KU	Accept data and address without bracketed detail. Any other valid may include carry, overflow, flag, zero, negative etc.
5.		Addressability.	1 KU	Accept answers that mention 'address' as address is not mentioned in the question.

Question		Expected Answer(s)	Max Mark	Additional Guidance
6.		<ul style="list-style-type: none"> • <u>Access/write/read</u> times/speeds are faster (than magnetic devices). • Device can be smaller in physical size (without constraints of space for moving parts). • Fragmentation does not result in greater seek time. • Less power is required for solid state drives (as moving parts within hard drives require more power). • Actual data transfer rate will be higher due to architecture of SSD. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
7.		Data format conversion.	1 KU	
8.		<ul style="list-style-type: none"> • Store/process webpages • Allows access to web pages (HTML pages)/HTTP documents. • Allows website hosting. • Allows server side creation of dynamic webpages. • Caching frequently accessed webpages. • Filtering content of incoming data/webpages. • Any other valid <p>Any bullet for a maximum of 1 mark.</p>	1 KU	Vague references to Internet/www should not be accepted as the question is not about the function of browser software.
9.		<ul style="list-style-type: none"> • To instigate system start-up. • Load start-up instructions to RAM. • Locate/load OS on backing storage/in boot sector. • Locate system folder on hard disk drive/solid state drive. <p>Any bullet for a maximum of 1 mark.</p>	1 KU	
10.		Utility Software/Utility Program/Utilities.	1 KU	
11.	(a)	<i>Macro Virus.</i>	1 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
11.	(b)	<ul style="list-style-type: none"> • An initial checksum/calculation is performed on the file (prior to infection). • A second checksum/calculation is performed upon opening/execution. • A difference in the value returned indicates the possible presence of a virus. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	Accept alternative expression of points shown.
12		<p>Discussions/interviews/meetings between analyst & client will be repeated (1 mark)</p> <p>AND one of:</p> <ul style="list-style-type: none"> • To clarify exact requirements. • As a result of new information. • To confirm budgets (timescales). <p>Any bullet for 1 mark</p> <p>OR</p> <p>Repeated refinement of specification (1 mark). based on new information (1 mark).</p> <p>Maximum of 2 marks</p>	2 PS	Generic description of iteration across stages is not valid. The <i>production</i> of the software specification is unique to the analysis stage.
13	(a)	Pseudocode.	1 KU	
13	(b)	<ul style="list-style-type: none"> • In: amount. • In: rate. • Out: interest. <p>Any bullet for a maximum of 1 mark.</p>	1 PS	Must include in/out for mark.

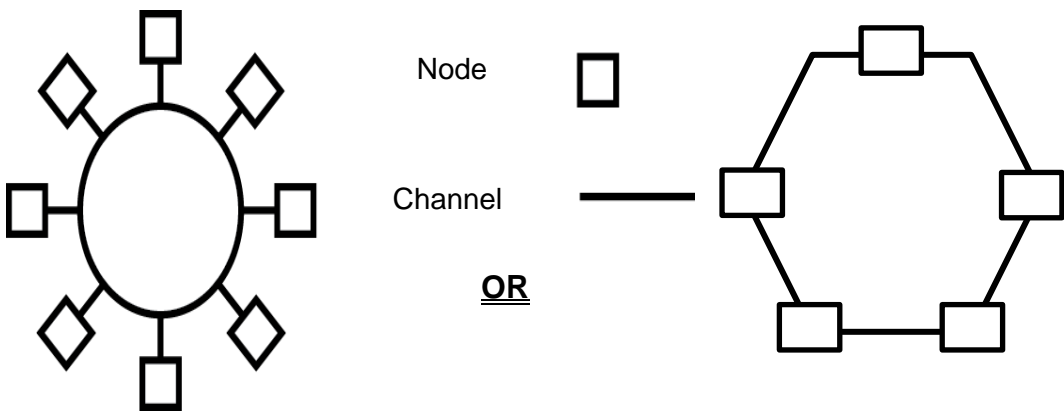
Question		Expected Answer(s)	Max Mark	Additional Guidance
14.		<ul style="list-style-type: none"> • Code is prewritten/so does not need to be typed in • Code is pretested/error free/so less time required during testing • Code is pre-documented/so less time required during documentation stage • Programmer can use code which he/she may not have been able to produce himself/herself. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	
15.	(a)	Efficiency/efficient.	1 KU	
15.	(b)	Portability/portable.	1 KU	
16.		<ul style="list-style-type: none"> • (To allow experts) to extend/customise the functionality of the application. • To make the application more flexible/usable by a larger group of users/novice users. • Customise the user interface. • Increase productivity due to macros executing faster than human/manual execution/automate repetitive tasks • Allows complex actions to be triggered by one key press. <p>Any bullet for a maximum of 1 mark</p>	1 KU	
17.	(a)	<ul style="list-style-type: none"> • Data type • Number of elements/size of array/range of indices/index number • Initial value • Position in RAM • Any other valid <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
17.	(b)	<ul style="list-style-type: none"> Does not take up additional memory/contains only the memory address pointer (1 mark) storing a second copy of the array (1 mark) <p>OR</p> <ul style="list-style-type: none"> Does not waste processor time (1 mark) making a second copy of the array (1 mark) <p>1 mark for each part of a valid pair for a maximum of 2 marks.</p>	2 PS	
18		<ul style="list-style-type: none"> Test the program more objectively/without bias/no expectation of output More likely to apply a range of test data/cases. ITG are likely to find errors missed by programmers during testing/avoids corrective maintenance. ITG will not sign off the project just to make a deadline. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	

[END OF SECTION I]

SECTION II

Question			Expected Answer(s)	Max Mark	Additional Guidance
19.	(a)	(i)	<ul style="list-style-type: none"> • Pixel Level Editing • Michael could include photographs • Not limited to mathematical objects <p>Any bullet for a maximum of 1 mark.</p>	1 KU	Do not accept 'bit editing', must be pixel editing
19.	(a)	(ii)	<ul style="list-style-type: none"> • Resolution independent. • Scalable without losing detail/becoming blocky. • Layering (of objects) is possible. • Edit individual objects rather than pixel-by-pixel. • Any other valid. <p>Any bullet for a maximum of 1 mark.</p>	1 KU	
19.	(b)		<ul style="list-style-type: none"> • Temporarily stores print jobs in (fast) backing storage (accept an example). • Queues jobs until printer is ready to receive them. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	
19.	(c)		<ul style="list-style-type: none"> • Enough available/minimum necessary backing storage to store the software. • Enough main memory/RAM to allow the software to run. • Adequate clock speed to process data • Compatibility of processor • Availability of appropriate peripherals/interfaces/sound card/graphics card <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	Do not accept answers that relate to the operating system. Context relates to hardware compatibility. Two answers from the final bullet point only gain one mark.

Question		Expected Answer(s)	Max Mark	Additional Guidance
19.	(d)	<ul style="list-style-type: none"> Locates data in main memory prior to transfer. <u>Communicates with file management</u> (to ensure that the file allocation table is updated). <u>Communicates with I/O Management</u> (to ensure that data can be transferred to backing storage). <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
19.	(e)	Copyright, Designs and Patents Act (1 mark).	1 KU	
20.	(a)	 <p>The diagram illustrates a network topology. On the left, a central circle is connected to eight nodes: four squares and four diamonds. On the right, a legend shows a square labeled 'Node' and a line labeled 'Channel'. Below the legend, the word 'OR' is underlined. To the right of 'OR', a ring network is shown with six square nodes connected in a closed loop by lines representing channels.</p> <p>1 Mark for correct structure.</p> <p>1 Mark for correct labelling of at least one node AND one channel.</p> <p>Note – Accept alternative terms for node and channel</p> <p>Maximum of 2 marks</p>	2 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
20.	(b)	<ul style="list-style-type: none"> • Busy • Clear to send/Ready to send • Request to send • Acknowledge • Synchronise • Clear to receive/Ready to receive • Any other valid <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p> <p><u>Answer must be relevant to the scenario of the camera.</u></p>	2 PS	Accept acronyms without complete terms eg RTS/ACK/CTS/SYN.
20.	(c)	<ul style="list-style-type: none"> • Fewer transmission errors as skewing is not an issue. • Single line ensures that data cannot be skewed. <p>Either bullet for a maximum of 1 mark.</p>	1 PS	Similar expressions are possible.
20.	(d)	<p>Watching (1 mark), as the virus is watching for a specific action/condition (the online bank access) (1 mark).</p> <p>Maximum of 2 marks</p>	2 PS	Waiting is not valid. Double jeopardy is not applicable here.

Question		Expected Answer(s)	Max Mark	Additional Guidance
20.	(e)	<ul style="list-style-type: none"> Worms self-replicate (without a host) (1 mark), a Trojan horse cannot self-replicate (1 mark). <p>OR</p> <ul style="list-style-type: none"> Worms replicate across networks attacking ports (1 mark), a Trojan horse will only infect one station at a time (1 mark). <p>1 mark – Correct statement about a worm 1 mark – Correct statement about a Trojan</p> <p>Candidate cannot gain two marks for sub parts of two separate bullet points.</p> <p>Maximum of 2 marks</p>	2 PS	
21	(a)	<ul style="list-style-type: none"> Pre-fetched instructions stored in cache. reducing time needed to access slower main memory. <p>OR</p> <ul style="list-style-type: none"> Holds frequently used instructions (preloaded into cache) speeding up the fetch/execute cycle <p>OR</p> <ul style="list-style-type: none"> Cache memory switching/access speed is high reducing latency/idle time <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p> <p>Need statement and consequence for both marks.</p> <p>Accept second part of a different answer if consequence is valid in relation to statement.</p>	2 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance			
21.	(b)	<p>1 Set address bus up with relevant memory address.</p> <p>2 Data bus is set up with data to be written/transferred.</p> <p>3 Write line is activated.</p> <p>4 Data on data bus is transferred to memory location identified by address bus.</p> <p>For steps 1 and 2 it is acceptable for the candidate to refer to registers (MAR, MDR).</p> <p>In the case of incorrect order, award a maximum of 3 marks</p>	4 PS	For step 4, data being transferred on the data bus is not sufficient on its own. Candidate must make reference to appropriate memory location.			
21.	(c)	<p>Possible solutions:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; padding: 5px;"> $2^{32} * d = 64\text{GB}$ $64\text{Gb}/2^{32} = \text{data bus width}$ $549755813888/4294967296\text{bits} = 128$ Data Bus Width is 128 (lines) </td> <td style="width: 33%; padding: 5px;"> $64\text{GB} = 549755813888\text{ bits}$ $2^{32} = 4294967296\text{ memory locations}$ $549755813888/4294967296 = 128$ Data Bus Width is 128 (lines) </td> <td style="width: 33%; padding: 5px;"> $2^{32} = 4\text{GB}$ $64/4 = 16\text{ Bytes}$ $16 * 8 = 128$ Data Bus Width is 128 (lines) </td> </tr> </table> <p>$2^{32} = 1\text{ mark}$ Resolving units = 1 mark Final answer = 1 mark Maximum of 3 marks</p> <p>Note - Correct answer of 128 with no working gains full marks. The word 'lines' is not necessary as it is part of the question.</p>	$2^{32} * d = 64\text{GB}$ $64\text{Gb}/2^{32} = \text{data bus width}$ $549755813888/4294967296\text{bits} = 128$ Data Bus Width is 128 (lines)	$64\text{GB} = 549755813888\text{ bits}$ $2^{32} = 4294967296\text{ memory locations}$ $549755813888/4294967296 = 128$ Data Bus Width is 128 (lines)	$2^{32} = 4\text{GB}$ $64/4 = 16\text{ Bytes}$ $16 * 8 = 128$ Data Bus Width is 128 (lines)	3 PS	
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Question			Expected Answer(s)	Max Mark	Additional Guidance
21	(d)	(i)	<ul style="list-style-type: none"> FLOPS isolate processor capability/are independent of other components when measuring performance. FLOPS are independent of instruction size FLOPS are independent of instruction complexity FLOPS are independent of word size FLOPS are independent of clock speed FLOPS are a measure of actual arithmetic capability FLOPS provide an industry standard for measuring processor performance. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
21.	(d)	(ii)	<p>Application based tests take account of other aspects of the system (such as main memory/cache memory/data bus width) (1 mark).</p>	1 KU	
22.	(a)		<ul style="list-style-type: none"> Unwillingness of some members of staff to cooperate leading to lack of information. Contradictory information given. Irrelevant information given. Inaccurate/Incomplete information given. Lack of knowledge in relation to how the current system could be improved Any other valid <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	Answer may be expressed in context.
22.	(b)		<p>The problem is broken down into smaller/easier to solve (sub) problems.</p>	1 KU	If the candidate explains top down design and then goes onto explain stepwise refinement they should not be penalised.

Question		Expected Answer(s)	Max Mark	Additional Guidance
22.	(c)	<ul style="list-style-type: none"> • Pre-defined routines for the creation of objects • Pre-defined code attached to each object • Order of execution is decided by the user (does not follow a specific order). • Allow sections of code to be triggered/executed via a button. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	
22.	(d)	<ul style="list-style-type: none"> • Programmers will each be writing individual subprograms for software required. • Thus reducing implementation time. <p>OR</p> <ul style="list-style-type: none"> • They must collaborate via meetings/project manager/detailed plan. • Will discuss how to implement the design/get help from more experienced programmer. <p>OR</p> <ul style="list-style-type: none"> • Discuss testing to reduce time wasted/find and solve problems earlier. • Ensure testing is systematic and comprehensive. <p>OR</p> <ul style="list-style-type: none"> • Programmers will each be writing individual subprograms for software required (1 mark). • They must collaborate via meetings/project manager/detailed plan. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	Examples illustrating a mixture of the above bullet points are acceptable.

Question		Expected Answer(s)	Max Mark	Additional Guidance
22.	(e)	<ul style="list-style-type: none"> Methodical/logical/planned checking of software. Test individual subroutines, then modules, up to whole system testing. <p>Either bullet for a maximum of 1 mark</p>	1 KU	
22.	(f)	<ul style="list-style-type: none"> More memory efficient (1 mark) as translator software not held in memory (1 mark) More processor efficient (1 mark) as program not translated each time the program runs (1 mark) Source code unavailable (1 mark) therefore protected from alteration/editing/copyright infringement (1 mark) Any other valid reason (1 mark) with appropriate explanation (1 mark) 	2 PS	<p>Need statement and consequence from one bullet for both marks.</p> <p>Candidate cannot gain two marks for sub parts of two separate bullet points.</p>
22.	(g)	<ul style="list-style-type: none"> Descriptive variable/procedure names. Effective use of whitespace (indentation and/or blank lines). Internal commentary. Use of functions/subroutines/modules Any other valid. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
22.	(h)	<ul style="list-style-type: none"> To make the software accessible to more users/platforms/operating systems (increase sales) Reduced workload for implementation on new platforms. Reduced workload for future upgrades Any other valid <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	
22.	(i)	<p>Perfective (1 mark), as they are adding a new feature not in the original software (1 mark).</p> <p>Maximum of 2 marks</p>	2 PS	
23.	(a)	Joining together of (sub) strings/characters.	1 KU	
23.	(b)	Array (1 mark), of strings (1 mark).	2 PS	
23.	(c)	<p>(i)</p> <pre> Set count to zero For each member If region(position) = "East" OR region(position) = "West" then Add 1 to count End if End loop </pre> <p>OR</p> <pre> Counter=0 For member= 1 to number If region(member) = "East" OR region(member) = "West" then counter=counter + 1 End if Next member </pre> <p>1 mark for initialisation 1 mark for loop with termination 2 marks for IF...END IF with complex condition 1 mark for increment</p> <p>Note – When an IF...END IF is present with two simple conditions (instead of a complex condition) then one mark should be awarded rather than two</p> <p>Note – Variable names may differ from the ones used above</p> <p>Note – Loop control variable should not refer to regions unless clearly related to an array/list</p>	5 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
23.	(c)	(ii)	<p>If region(position) = East OR region(position) = West</p> <p> Add 1 to count</p> <p> <u>Display email</u>(position)</p> <p>End if</p> <p>1 mark for adding a line to display the email</p> <p>1 mark for the line being within the IF.... ENDIF/in correct position.</p>	2 PS	Index (position) not required to award first mark.
23.	(c)	(iii)	<ul style="list-style-type: none"> • CASE (statement) • Nested IF <p>Either bullet for a maximum of one mark</p>	1 PS	
23.	(d)	(i)	Whole program.	1 KU	
23	(d)	(ii)	<ul style="list-style-type: none"> • Makes data flow clearer, so improves maintainability/readability. • Increases portability, can re-use without changing variable names. • Aids modularity • Reduces unexpected clashes between variable names. • Reduces impact or load on main memory • Any other valid <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	

[END OF SECTION II]

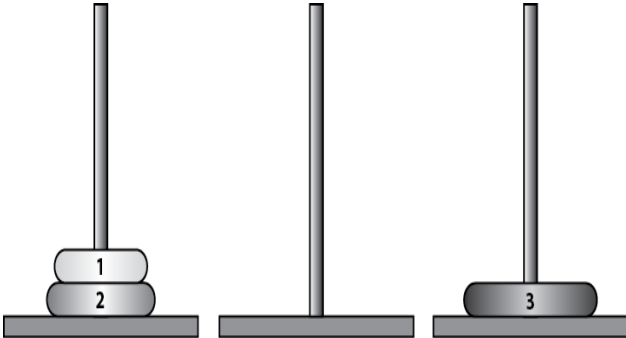
SECTION III

Part A – Artificial Intelligence

Question		Expected Answer(s)	Max Mark	Additional Guidance
24	(a)	<ul style="list-style-type: none"> Identify keywords from Niall's input. Match keywords to a standard set of phrases and output. Or manipulate the sentence structure to create a new phrase. Respond generically if no match found. Any other valid. <p>1 mark for each of 3 bullets for a maximum of 3 marks</p>	3 KU	
24.	(b)	<ul style="list-style-type: none"> No effect (1 mark), since keywords are irrelevant of order (1 mark). No effect (1 mark), since any keywords will still be identified and the matching response output (1 mark). No effect (1 mark), since it responds generically (1 mark). Won't be able to parse/analyse/determine the meaning of the sentence (1 mark) so will output generic response (1 mark). <p>1 mark for each part of a valid pair, for a maximum of 2 marks.</p>	2 PS	Vague responses such as "Doesn't understand the sentence" or "it is confused by order" or "it responds randomly" gain no marks.
24.	(c)	<p>(i) NLU - Natural Language Understanding (1 mark)</p> <p>AND</p> <ul style="list-style-type: none"> Attempts to derive meaning of the sentence (1 mark) OR parses sentence to identify components /nouns/verbs etc (1 mark) OR identifies the meaning of words (1 mark) OR Any other valid. <p>1 mark for name, 1 mark for description, for a maximum of 2 marks</p>	2 KU	

Question			Expected Answer(s)	Max Mark	Additional Guidance
24.	(c)	(ii)	<ul style="list-style-type: none"> NLG - Natural Language Generation. 	1 PS	
24.	(d)		<ul style="list-style-type: none"> Changing nature of language (1 mark) – google, surf etc. (1 mark) Ambiguity such as multiple meanings (1 mark) – saw, charge (1 mark). Incorrect use of words with different spelling (1 mark) - sea instead of see (1 mark) <p>1 mark for the problem and 1 mark for an example of a language difficulty for a maximum of 2 marks.</p>	2 PS	The example must relate to <u>typed</u> input.
24.	(e)		<ul style="list-style-type: none"> Use of humour because computers would deal literally instead of recognising humour. Referring back to previous responses because computers would not be able to store or track previous responses. Use current/topical knowledge because up-to-date knowledge may not be coded. Use non-standard language/slang Any other valid. <p>Any bullet for a maximum of 1 mark.</p>	1 PS	
24.	(f)		<ul style="list-style-type: none"> Procedural uses a range of data types for variables. Procedural uses control structures such as loops etc. Sequence of statements is more rigid in a procedural language/defined start and end Procedural follows a programmer designed algorithm Any other valid. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
25.	(a)		<ul style="list-style-type: none"> Specialise in a particular field of medicine. Specialise in a particular age group, gender etc. Any other valid. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	
25.	(b)		<ul style="list-style-type: none"> The outputs from one layer of neurons are fed to the next layer as input. Each neuron takes inputs from others on the layer below. Any other valid. <p>Any bullet for a maximum of 1 mark</p>	1 KU	
25	(c)	(i)	<ul style="list-style-type: none"> Expected output and actual output are different. Weights are altered/rebalanced to reduce or increase the influence of an input. Influences when the neuron fires (as a result of exceeding the threshold value). To achieve the desired output. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	
25.	(c)	(ii)	<ul style="list-style-type: none"> Threshold value. Level/value at which a neuron is fired. <p>Any bullet for a maximum of 1 mark</p>	1 KU	
25.	(c)	(iii)	The process of feeding inputs and known outputs is repeated until correct results produced	1 KU	
25.	(d)		<ul style="list-style-type: none"> Multiple processors. Can perform multiple neuron calculations at the same time. Reducing response times for diagnosis. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	

Question		Expected Answer(s)	Max Mark	Additional Guidance									
25.	(e)	<ul style="list-style-type: none"> • Problem solving. • Memory. • Creativity. • Cognitive ability. • Language. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU										
26.	(a)	[(), (), (3,2,1)]	1 PS										
26.	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Start state</th> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>[(3,2,1), (), ()]</td> <td>[(3,2), (1), ()]</td> <td>[(3), (1), (2)] or [(3,2), (), (1)]</td> </tr> <tr> <td>[(3,2,1), (), ()]</td> <td>[(3,2), (), (1)]</td> <td>[(3), (2), (1)] or [(3,2), (1), ()]</td> </tr> </tbody> </table> <p>1 mark for either correct X, 1 mark for either correct following node.</p>	Start state	X	Y	[(3,2,1), (), ()]	[(3,2), (1), ()]	[(3), (1), (2)] or [(3,2), (), (1)]	[(3,2,1), (), ()]	[(3,2), (), (1)]	[(3), (2), (1)] or [(3,2), (1), ()]	2PS	
Start state	X	Y											
[(3,2,1), (), ()]	[(3,2), (1), ()]	[(3), (1), (2)] or [(3,2), (), (1)]											
[(3,2,1), (), ()]	[(3,2), (), (1)]	[(3), (2), (1)] or [(3,2), (1), ()]											
26.	(c)	<p>Uses less memory (1 mark)</p> <p>AND</p> <ul style="list-style-type: none"> • Because it only holds nodes on the current path (1 mark) OR • Can backtrack and so can abandon nodes/remove nodes/overwrite nodes (1 mark). <p>1 mark for statement, 1 mark for reason for a maximum of 2 marks</p>	2 KU										
26.	(d) (i)	 <ul style="list-style-type: none"> • N.B. Numbers on discs are not required. 	1 PS										

Question			Expected Answer(s)	Max Mark	Additional Guidance
26.	(d)	(ii)	<ul style="list-style-type: none"> • [(2),(1),(3)] • [(),(1),(3,2)] <p>1 mark each for the 2 missing nodes for a maximum of 2 marks.</p> <p>Order must be correct</p>	2 PS	A valid move from second state (a candidate's first response) to third state (a candidate's second response) should be awarded 1 mark even if second state is wrong.
26.	(e)	(i)	<ul style="list-style-type: none"> • Each descendant node is scored. • Locating the more promising/likely node or discarding less likely nodes. • Reducing the search space/nodes to be calculated or considered. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	
26.	(e)	(ii)	<ul style="list-style-type: none"> • Each node can only have few/ two or three descendants. • Which means that the search tree/amount of nodes will not become large (within a small number of moves). <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	
26.	(e)	(iii)	<ul style="list-style-type: none"> • Use of cache or larger cache. • Increased clock speed. • Larger RAM/faster access RAM. • Any other valid. <p>Any bullet for a maximum of 1 mark</p>	1 PS	
27.	(a)		A=eardrum (1 mark), A=ossicles (1 mark)	2 PS	"A=" is necessary for the mark. No capital letters allowed for 'eardrum' and 'ossicles'.

Question		Expected Answer(s)	Max Mark	Additional Guidance
27	(b)	<p>?- function_of(A, cerebellum).</p> <p>1 mark for function_of and both arguments</p> <p>1 mark for correct order of arguments</p>	2 PS	? - Not necessary to award marks. The variable (shown as A) can be any letter or word that starts with a capital letter.
27.	(c)	<ul style="list-style-type: none"> • Match at 13, A instantiated to ossicles, <u>sub-goal is part(ossicles,B).</u> • Match at 8, B instantiated to middle_ear, <u>output solution B=middle_ear.</u> • Match at 14, A instantiated to ossicles, <u>sub-goal is part(ossicles,C).</u> • Match at 8, C instantiated to middle_ear, <u>sub_goal is located_in(middle_ear, B).</u> • Match at 13, A instantiated to middle_ear, <u>sub-goal is part(middle_ear, B)</u> • Match at 2, B instantiated to ear, <u>output B=ear.</u> <p>1 mark each of six underlined parts, 1 mark for one instance of sub-goal.</p>	7 PS	Do not need to show instantiation in the sub-goal eg award the first mark for A is ossicles, sub-goal is_part(A,B)
27.	(d)	<ul style="list-style-type: none"> • When a sub-goal fails or when no more descendants. • Prolog returns to an earlier point (of success or instantiation in a sub-goal) . • Resumes searching from that point. • Tries a previously untried branch. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	

[END OF SECTION III – PART A]

SECTION III

Part B – Computer Networking

Question			Expected Answer(s)	Max Mark	Additional Guidance
28.	(a)	(i)	SMTP.	1 PS	
28.	(a)	(ii)	FTP.	1 PS	
28.	(a)	(iii)	HTTP.	1 PS	
28.	(b)		<p>Class B (1 mark)</p> <p>AND</p> <ul style="list-style-type: none"> The <u>first octet</u> (178) is in the <u>correct range</u> for class B (128 to 191). (1 mark) <p>OR</p> <ul style="list-style-type: none"> The position of the first zero in the binary conversion of the first octet is the second most significant bit. (1 mark) 	2 PS	
28.	(c)		<ul style="list-style-type: none"> The first two octets need to be the same as the others on the network (178.21). The first octet should be the same as the others on the network/178 <p>Any bullet for a maximum of 1 mark</p>	1 PS	
28.	(d)		<ul style="list-style-type: none"> The DNS searches its database for the domain name. Matches the Domain Name to its corresponding IP address. Returns the IP address to the browser. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
28.	(e)		<ul style="list-style-type: none"> • Open & close head tags in correct position. • Open & close body tags in correct position. • Open & close title tags in correct position (inside head tags) with correct text • Open & close underline tags with correct text as long as not located within the head or title tags <p>1 mark for each bullet for a maximum of 4 marks</p>	4 PS	<p>Ignore irrelevant/additional tags Do not accept “ “ or ‘ ‘ as part of text</p> <p>Some candidates may respond using CSS in addition to HTML, this is acceptable if correct. For example, for bullet 4 a candidate may write:</p> <pre><div style ="text-decoration: underline"> FunPark </div></pre>
28.	(f)	(i)	WAP (Wireless Application Protocol)	1 PS	
28.	(f)	(ii)	<ul style="list-style-type: none"> • Code has been changed due to a change in the environment. • There are no new features being added or errors being corrected. <p>Any bullet for a maximum of 1 mark</p>	1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
28.	(f)	(iii)	<ul style="list-style-type: none"> • WML has limited support for tables/images/multimedia plugins. • Pages arranged in stacks of cards in WML (A deck is a set of WML cards, a site is a set of HTML pages). • Limited text formatting/range of tags in WML. • Restricted graphic format without conversion (to WBMP format). • Standard JPG/GIF/PNG formats cannot be displayed in WML without conversion (to WBMP format). • In WML, variables can be defined, (variables cannot be stored in HTML). • WML is viewed in a micro-browser, (HTML uses regular browsers, such as Internet Explorer). • WML is case sensitive, (HTML is not case sensitive). <p>Any bullet for a maximum of 1 mark</p>	1 PS	
28.	(g)		<ul style="list-style-type: none"> • The meta-search engine would send a request to multiple search engines. • The results would then be displayed in a single list. • Results in list will have been aggregated <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	
28.	(h)		<p>Spider (1 mark).</p> <p>To match the keywords returned by a user search (1 mark).</p>	2 PS	
29.	(a)		<p>Change Aimee's <u>permissions/access rights</u> to give access to the file.</p>	1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
29.	(b)		<ul style="list-style-type: none"> Any unauthorised change to data, for example a customer account. Unauthorised transfer of money from one account to another. Change the bank's network infrastructure configuration. DOS attack/Resource Starvation to deliberately bring down the network Any other valid which indicates that data will be modified, destroyed, or redirected. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	
29.	(c)	(i)	<ul style="list-style-type: none"> Data is sent one byte/character/group of bits at a time. A start and stop bit is used. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	
29.	(c)	(ii)	<ul style="list-style-type: none"> The additional start & stop bits represent an extra overhead in the transmission process. And would increase data transfer time. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 PS	
29.	(d)	(i)	<ul style="list-style-type: none"> TCP splits the data into packets TCP adds a header/sequence number/header. TCP reassembles the packets when they arrive at their destination address. <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	
29	(d)	(ii)	<ul style="list-style-type: none"> IP adds its own <u>address</u> header to each packet. IP routes the packets around the network. <p>Any bullet for a maximum of 1 mark</p>	1 KU	

Question			Expected Answer(s)	Max Mark	Additional Guidance
29.	(e)	(i)	<ul style="list-style-type: none"> Block certain keywords. Block certain URLs/specific sites. Block certain/a range of IP addresses <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	
29.	(e)	(ii)	A walled garden has a list of suitable sites and only these can be accessed.	1 PS	
29.	(e)	(iii)	<ul style="list-style-type: none"> Some/new unsuitable URLs might not be on the restricted list. Some/new unsuitable keywords might not be on the restricted list. Use of a proxy server to bypass internet filtering software and access unsuitable sites <p>Any bullet for a maximum of 1 mark</p>	1 PS	
30.	(a)	(i)	<ul style="list-style-type: none"> Each packet is given a destination address and a sequence number. Each individual packet can take a different path through the network to its destination. At the destination the packets are reassembled (using their sequence number). <p>1 mark for each of 2 bullets for a maximum of 2 marks</p>	2 KU	

Question			Expected Answer(s)	Max Mark	Additional Guidance
30.	(a)	(ii)	<ul style="list-style-type: none"> • Communication channels can be shared (1 mark), since packets from different users can be mixed along a transmission line (1 mark). <p>OR</p> <ul style="list-style-type: none"> • Improves system performance (1 mark), as packets do not have to follow same route / each packet takes the most efficient route (1 mark). <p>OR</p> <ul style="list-style-type: none"> • Security improved (1 mark), because if line is “hacked” individual packets will be intercepted rather than whole message / file (1 mark). <p>OR</p> <ul style="list-style-type: none"> • Packet switching data transfer rate is usually faster than circuit (1 mark), as it allows network hardware to decide on most efficient / fastest route (1 mark). <p>OR</p> <ul style="list-style-type: none"> • Packet switching uses full bandwidth (1 mark), whereas circuit switching can result in unused bandwidth (1 mark). <p>1 mark for each subpart of <u>the same bullet</u> for a maximum of 2 marks.</p>	2 PS	
30.	(b)		<ul style="list-style-type: none"> • WPAN (generally) operate at a lower bandwidth/slower data transfer than a WLAN. • WPAN operates at shorter distances than WLAN. • WPAN uses less power than WLAN. • WLAN would require a router. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	

Question			Expected Answer(s)	Max Mark	Additional Guidance
30.	(c)	(i)	<p>To ensure that:</p> <ul style="list-style-type: none"> • Communications equipment and networking software would be compatible. • Computers (on different networks) could communicate with each other. <p>Any bullet for a maximum of 1 mark</p>	1 PS	
30.	(c)	(ii)	To uniquely identify each device on the network.	1 KU	
30.	(c)	(iii)	Data Link Layer.	1 KU	
30.	(d)	(i)	<p>Odd (Parity) (1 mark)</p> <p>AND</p> <ul style="list-style-type: none"> • number of / three 1's before being sent indicates odd parity. (1 mark) <p>OR</p> <ul style="list-style-type: none"> • even number of / four 1's at destination with an error indicates odd parity. (1 mark) <p>1 mark for Odd 1 mark for either bullet</p>	2 PS	
30.	(d)	(ii)	Cyclic redundancy check (accept CRC) (1 mark).	1 PS	
30.	(e)		<ul style="list-style-type: none"> • Size = $25 \times 8 = 200$ megabits. (1 mark) • Rate = $200/5 = 40$ megabits per second. (1 mark) <p>OR</p> <ul style="list-style-type: none"> • $25 / 5 = 5$ megabytes per second. (1 mark) • 5 megabytes = $5 * 8 = 40$ megabits per second. (1 mark) <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
30.	(f)	(i)	<ul style="list-style-type: none"> • Can compare prices easily. • Discounts are usually given for buying online. • Less queuing at the shops/high street travel agents/don't need to travel to shop. • Any other valid. <p>Any bullet for a maximum of 1 mark</p>	1 PS	
30.	(f)	(ii)	<ul style="list-style-type: none"> • Small padlock (at the foot of the browser). • https (in the address bar). • Any other valid. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	

[END OF SECTION III – PART B]

Section III

Part C – Multimedia Technology

Question			Expected Answer(s)	Max Mark	Additional Guidance
31.	(a)	(i)	<ul style="list-style-type: none"> • Ready-made buttons, colour schemes, etc are provided. • No need for coding. • See output in real time • Easier to preview (in different browsers) • Any other valid. <p>Any bullet for a maximum of 1 mark</p>	1 PS	If a candidate defines the acronym WYSIWYG without further clarification no mark is awarded
31.	(a)	(ii)	<ul style="list-style-type: none"> • Greater control of features/timings. • Access to low level commands. • Access to other applications. • Re-use blocks of code • Automatic code completion • Code/Syntax highlighting • Any other valid <p>Any bullet for a maximum of 1 mark</p>	1 PS	
31.	(b)		<p>Adaptive (1 mark)</p> <p>OR</p> <p>Corrective (1 mark)</p>	1 PS	<p>In a school situation the operating environment could initially be limited to a single browser, therefore adaptive is accepted.</p> <p>Other situations may initially make use of multiple browsers, therefore corrective is accepted.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
31.	(c)	<ul style="list-style-type: none"> No permanent copy of file stored on computer (1 mark) - so reduces opportunity for (illegal) copying (1 mark). The media plays as the data is received (1 mark) rather than waiting for the entire file to download before playback (1 mark) <p>1 mark for each subpart of the <u>same bullet</u> for a maximum of 2 marks.</p>	2 KU	
31.	(d)	<ul style="list-style-type: none"> Any position of video can be played immediately (1 mark) as entire video is available rather than only the buffered content/frames (1 mark) Entire file must be downloaded before playback (1 mark) therefore no lag/buffering (1 mark) <p>1 mark for each subpart of the <u>same bullet</u> for a maximum of 2 marks.</p>	2 PS	
31.	(e)	<p>No. of frames = $32 \times 25 = 800$ (1 mark). Frame size = $1280 \times 720 \times 24 \text{ bits} = 22118400$ bits (1 mark).</p> <p>File size = No. of frames x Frame size.</p> <p>= 800×22118400 bits. = 17694720000 bits. = 2.0599365234375 Gb. = <u>2.06 Gb</u> (1 mark).</p> <p>Maximum of 3 marks</p>	3 PS	<p>Award 3 marks for correct answer with no explanation.</p> <p>Accept 2.06 without units as units required are stated in the question.</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance
31.	(f)		<ul style="list-style-type: none"> Each key frame is stored as a JPEG (which is itself compressed). Delta frames store changes between intermediate frames <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	Do not accept description of MPEG that does not address compression.
31.	(g)	(i)	MIDI	1 KU	
31.	(g)	(ii)	<ul style="list-style-type: none"> MIDI stores attributes of the sound. Different sound cards will interpret attributes differently to play a sound. Different sound cards have different in-built sounds used to synthesise playback <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
32.	(a)		<ul style="list-style-type: none"> Increase resolution. Pixels are smaller so curves are smoother. Enable Interpolation <p>1 mark for each bullet, for a maximum of 2 marks.</p>	2 PS	
32.	(b)		<ul style="list-style-type: none"> Anti-aliasing. Use of intermediate shades between two main colours/beside edges <p>1 mark for each bullet for a maximum of 2 marks.</p> <p>Note – Pixels are not added, the shade of pixels is altered</p>	1 PS 1 KU	
32.	(c)	(i)	JPEG does not support transparency (resulting in white boxes blocking background)	1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
32.	(C)	(ii)	<ul style="list-style-type: none"> • GIF • PNG <p>Any bullet for a maximum of 1 mark</p>	1 KU	
32.	(d)		GIF	1 KU	
32.	(e)		<ul style="list-style-type: none"> • Digital camera CCDs are in an array/table/grid. • Scanner CCDs are arranged in a line. <p>1 mark for each bullet for a maximum of 2 marks.</p>	2 KU	
32.	(f)	(i)	<ul style="list-style-type: none"> • Output quality matches hardware capability (1 mark), reducing likelihood of pixelation (1 mark). • Only a single file is needed rather than several files (1 mark) therefore reducing <u>overall</u> backing storage requirements (1 mark) <p>1 mark for each subpart of the <u>same bullet</u> for a maximum of 2 marks.</p>	2 PS	<p>For bullet two, the term 'storage' on its own is not sufficient.</p> <p>A simple comparison of vector and bitmapped file size is not appropriate; question specifies storing a font</p>
32.	(f)	(ii)	<ul style="list-style-type: none"> • Need to convert vector graphics into bitmap for display. • Some characters may be overly complex/ difficult to describe as vectors. • Very small, but complex, graphics have smaller file sizes as bitmaps. • More detailed customisation of fonts • Any other valid. <p>Any bullet for a maximum of 1 mark</p>	1 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
33.	(a)	<ul style="list-style-type: none"> • Depth/Z co-ordinate • Direction/Rotation • Lighting/shadow • Texture <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
33.	(b)	<ul style="list-style-type: none"> • VRML (Virtual Reality Modelling Language/ Virtual Reality Markup Language) • WRL (VRML world file extension) <p>Any 1 bullet for a maximum of one mark</p>	1 KU	Do not accept SVG (2D only).
33.	(c)	<ul style="list-style-type: none"> • Increased RAM/main memory. • Increased processor clock speed/throughput. • Multicore/parallel processing. • Increased availability of (real and virtual) 3D monitors. • Improved graphics cards. • Any other valid. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
33.	(d)	Data can be stored in layers/three dimensions (1 mark).	1 KU	
34.	(a)	<p>File size = 48000 x 12 x 16 (1 mark) x 6 (1 mark) bits = 55296000 bits = 6912000 bytes = 6750 Kb = 6.591796875 Mb = 6.59 Mb (1 mark)</p> <p>Maximum of 3 marks</p>	3 PS	3 marks to be awarded for correct answer with no explanation. Accept 6.59 without units as units required are stated in the question

Question			Expected Answer(s)	Max Mark	Additional Guidance
34.	(b)		<ul style="list-style-type: none"> Surround sound DSP (Digital Signal Processing) DAC (Digital to Analogue Conversion) <p>Any bullet for a maximum of 1 mark</p>	1 PS	<p>Accept other expressions of surround sound.</p> <p>Do not accept stereo sound.</p>
34.	(c)		<ul style="list-style-type: none"> Surround sound allows better impression of movement/panning/exact positioning of sound. Appropriate example – car/aircraft/helicopter passing, position of explosion, etc <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
34.	(d)		<ul style="list-style-type: none"> The amount of data required to <u>store 1 second</u> of sound. The number of bits to <u>transferred in 1 second</u> Throughput required for playback <p>Any bullet for a maximum of 1 mark</p>	1 KU	
34.	(e)	(i)	<ul style="list-style-type: none"> To make use of the full dynamic range. Increase amplitude of quiet sounds and decrease amplitude of loud sounds To bring the average or peak amplitude to a target level <p>Any bullet for a maximum of 1 mark</p>	1 KU	
34.	(e)	(ii)	<ul style="list-style-type: none"> Scaling of loud sounds would also reduce quiet sounds so they cannot be heard (1 mark). Scaling of quiet sounds may magnify/boost any background noise (1 mark) Sound balance may be unnatural (1 mark) <p>Any bullet for a maximum of one mark</p>	1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
34.	(f)	(i)	<ul style="list-style-type: none"> Convenient that all necessary files/file types are stored together in a single file. Easier to transfer a single file rather than many files. <p>Any bullet for a maximum of one mark</p>	1 PS	
34.	(f)	(ii)	<ul style="list-style-type: none"> May need a program/codec/plugin to recreate separate files. 	1 PS	
34.	(g)	(i)	To allow output (from computer) to speakers.	1 PS	
34.	(g)	(ii)	<ul style="list-style-type: none"> Carries out signal enhancements (reverberation/chorus effects)/applies effects. Handles MIDI files. <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 PS	
34.	(h)	(i)	<ul style="list-style-type: none"> Difference between samples is stored. Compression level 1:4 (using 4 bits rather than 16 bits). <p>1 mark for each of 2 bullets for a maximum of 2 marks.</p>	2 KU	
34.	(h)	(ii)	Sounds masked by loud sounds are not stored.	1 KU	

[END OF SECTION III – PART C]

[END OF MARKING INSTRUCTIONS]