



2015 Computing

Higher

Finalised Marking Instructions

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Part Two: 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 ie, 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 Three: Marking Instructions for each Question

Section I

Question		Expected Answer(s)	Max Mark	Additional Guidance
1.		<ul style="list-style-type: none"> Initiate/signal/activate/start a transfer (from processor) to memory Initiates a memory write operation <p>1 mark for 1 bullet point</p>	1 KU	<p>Note: must have reference to start of write process not actual transfer</p> <p>Note: 'Starts a write operation' is minimal acceptable</p>
2.		<p>Several bits are transmitted simultaneously (1 mark) using several wires (1 mark)</p>	2 KU	Diagram only – max of 1 mark
3.		<ul style="list-style-type: none"> Router connects LAN to WAN/Switch connects nodes on a LAN Router connects a network to a network/switch connects nodes on a network Router uses IP address/Switch uses a MAC address Router routes packets between different networks/switch routes packets in a LAN <p>1 mark for each part of a single bullet point.</p>	2 KU	<p>Switches & routers both send data to nodes so is not a difference</p> <p>Beware of answers which really refer to hubs & switches</p>
4.	(a)	<ul style="list-style-type: none"> Start physical address Creation date rw/ro/hidden File size Access rights Owner Modification date <p>1 mark for 1 bullet point</p>	1 KU	Data type not acceptable, reference to memory not acceptable
4.	(b)	<ul style="list-style-type: none"> Interpreting user commands Provides user interface Memory management I/O management Managing processes Resource allocation Error reporting <p>1 mark for 1 bullet point</p>	1 KU	'Manages processes' could include programs/applications

Question		Expected Answer(s)	Max Mark	Additional Guidance
5.		<ul style="list-style-type: none"> FLOPS measures real arithmetic work FLOPS is independent of architecture/instruction size/processor / etc MIPS only counts instructions performed MIPS has poor comparability due to instruction differences Any other valid <p>1 mark for each of 2 bullet points</p>	2 PS	Answer does not need to refer to MIPS
6.		<ul style="list-style-type: none"> 1000 0000 (1 mark) -128 (1 mark) 	2 PS	
7.	(a)	<p>Central node: network failure. (1 mark)</p> <p>Other nodes: no effect on the rest of the network (1 mark)</p>	2 KU	If candidate refers to 'node(s)' then a max of 1 mark
7.	(b)	<ul style="list-style-type: none"> Improved/user friendly browsers (1 mark) – deskill use of internet/allowing tabbed browsing/predictive text etc (1 mark) Improved installation software (1 mark) – resulting in less expertise required to set up networks (1 mark) Online games (1 mark) – encouraging a greater number of users (1 mark) Apps on phones (1 mark) – encouraging a greater number of users, making networks more accessible to more users. (1 mark) Use of social media (1 mark) – to keep in contact with others via networks (1 mark) Cloud (services) (1 mark) for file sharing/web applications (1 mark) File sharing software (1 mark) access to files creates network usage (1 mark) Any other valid development (1 mark) – associated explanation (1 mark) <p>2 marks for 1 bullet point, allocated as shown</p>	1 KU 1 PS	Accept brands for social media and other services eg Facebook, Instagram, Twitter, Office365, etc
8.		<ul style="list-style-type: none"> To clearly/precisely/unambiguously define the purpose of the software To create the software specification/ORD To identify the scope/boundaries of the problem Any other valid purpose <p>1 mark for 1 bullet point</p>	1 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
9.	(a)	<ul style="list-style-type: none"> • Structure diagram/chart • Flowchart • Semantic net • Data flow diagram • Storyboard • Any other valid <p>1 mark for 1 bullet point</p>	1 KU	
9.	(b)	<ul style="list-style-type: none"> • Can identify control structures visually • Can show the overall structure of a program • Any other valid <p>1 mark for 1 bullet point</p>	1 KU	'Can see the flow of data' is not sufficient: text based notations also show data flow
10.	(a)	<ul style="list-style-type: none"> • Meaningful variable/procedural names • Use of white space/indentation/blank lines • Internal commentary • Use of functions/modules/subroutines • Parameter passing <p>1 mark for 1 bullet point</p>	1 KU	
10.	(b)	<ul style="list-style-type: none"> • Maintenance is needed because of coding errors made by the programmers/errors noted after software is released • Errors were missed at the testing stage • Error/omission made by software company • Any other valid <p>1 mark for 1 bullet point</p>	1 PS	
11.	(a)	<ul style="list-style-type: none"> • Embedded in an application • Keywords are relevant to application • Uses control structures <p>1 mark for 1 bullet point</p>	1 KU	
11.	(b)	<ul style="list-style-type: none"> • Allows customisation of the features/user interface of a software • Creation of macros/allows automation of series of commands • To add extra functionality to the application • Used to generate client side content • Any other valid use <p>1 mark for 1 bullet point</p>	1 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
12.		<ul style="list-style-type: none"> • Input validation • Use of local rather than global variables • Error trapping routines • Use of exceptional/comprehensive testing • Any other valid <p>1 mark for 1 bullet point</p>	1 KU	Use of ITG is not a programming technique
13.		<ul style="list-style-type: none"> • Concatenation (1 mark) • Substring/String slicing (1 mark) <p>Accept examples of these drawn from the values in the question</p>	2 PS	Do not penalise poor spelling
14.		<ul style="list-style-type: none"> • To check if program fit for purpose/meets software specification • To construct suitable test data • To check that actual output matches expected output • To check that data used matches data in IPO part of software specification • To check for omissions • Any other valid <p>1 mark for 1 bullet point</p>	1 KU	
15.		<ul style="list-style-type: none"> • Fewer parameters/variables (1 mark) so readability should be improved/so less likelihood of errors/simplifies code/reduce development time (1 mark) • More memory efficient/uses less memory (1 mark) when passing parameters/because code is shorter (1 mark) • Loops can be used to perform an action (1 mark) rather than repeated instructions with different variables (1 mark) <p>2 marks for 1 bullet point, allocated as shown</p>	2 PS	
16.		<ul style="list-style-type: none"> • Module created within the program by its programmer, not already present/supplied (1 mark) • Has a value/which returns a single value to the program (1 mark) 	2 KU	

[END OF SECTION I]

Section II

Question			Expected Answer(s)	Max Mark	Additional Guidance
17.	(a)	(i)	Vector file size has reduced (1 mark) because there are fewer objects/instructions/attributes (1 mark)	2 PS	
17.	(a)	(ii)	<ul style="list-style-type: none"> • Bitmap stays the same (1 mark) • Same number of pixels/the same number of bits for each pixel/only bit pattern associated with colour has changed not its size (1 mark) 	2 PS	
17.	(b)		<ul style="list-style-type: none"> • Large number of objects being stored in vector • Large colour palette defined in vector • Build up of layered objects increase file size/layers merged in bitmap • Bit-map may have small bit depth • Small number of pixels in bitmap • Bitmap may be compressed/vector not compressed. <p>1 mark each for any two bullets</p>	2 PS	Accept reasons for large vector file size without reference to bitmap
17.	(c)		<ul style="list-style-type: none"> • GIF supports up to 256 colours which is adequate for this graphic (1 mark), resulting in smaller file size (1 mark) • GIF could be animated (1 mark), for a more interesting graphic (1 mark) • GIF uses compression (1 mark), for smaller file sizes (1 mark) • GIF uses lossless compression (1 mark) for no loss of detail (1 mark) • GIF supports transparency (1 mark) so there would be no white around the graphic (1 mark) <p>GIF is standard file format (1 mark) accessible on most platforms (1 mark)</p> <p>2 marks for 1 bullet point, allocated as shown</p>	2 PS	

Question		Expected Answer(s)	Max Mark	Additional Guidance
18.	(a)	<ul style="list-style-type: none"> Controls timing of operations through the use of a clock signal Decodes the instruction Ensures that instructions are carried out in correct order Initiates/activates control lines to control execution (accept examples of control lines eg initiate memory read) <p>1 mark for each of 2 bullet points Do not accept two answers from bullet 4</p>	2 KU	
18.	(b)	<ul style="list-style-type: none"> Cache is preloaded with instructions from main memory Processor checks cache for next instruction and fetches from there Which is faster access times than accessing slower main memory <p>1 mark each for any two bullet points</p>	2 KU	<p>Accept "frequently used instructions held in cache" (BP1)</p> <p>Accept idea of faster access to memory (BP3)</p>
18.	(c)	<ul style="list-style-type: none"> $2^2=4$ (1 mark) therefore two additional lines would be needed (1 mark) 2^{30} is four times bigger than 2^{28} (1 mark) therefore two additional lines would be needed (1 mark) $2^{30} \times 4 \text{ bytes}/32 \text{ bits} = 4\text{GB}$ (1 mark) therefore two additional lines would be needed (1 mark) $4\text{GB} = 2^a \times 32$ $2^a = 4\text{GB}/32$ $= 1073741824$ $a = 30 \text{ bits}$ (1 mark) so address bus needs to be increased by 2 bits <p>2 marks for 1 bullet point, marks allocated as shown</p> <p>Accept other mathematical explanations</p>	2 PS	<p>Descriptive answers such as "more lines" are insufficient</p> <p>Response which clearly states increase of two bits award 2 marks</p>
18.	(d)	<p>Bit depth = 16 bits (1 mark) Size = $160 \times 240 \times 16$ (1 mark) $= 75\text{KB}$ (1 mark)</p>	3 PS	

Question		Expected Answer(s)	Max Mark	Additional Guidance
18.	(e)	<ul style="list-style-type: none"> • Data format conversion (1 mark) – change A to D, serial to parallel (1 mark) • Handling of status signals (1 mark) – such as ready to receive/ready to send (1 mark) • Voltage conversion (1 mark) deals with different voltage levels of sensor and processor (1 mark) • Buffering (1 mark) – temporary storage of data in transit from sensor (1 mark) • Protocol conversion (1 mark) – different communication rules of sensor and processor (1 mark) <p>2 marks for 1 bullet point, marks allocated as shown</p>	1 KU 1 PS	
18.	(f)	<ul style="list-style-type: none"> • Interrupt signal is detected by processor • Current process is suspended • Current process is stored in stack • Interrupt routine identifies new function chosen • New process is given to the processor <p>1 mark for each of 2 bullet points</p>	2 KU	
18.	(g)	<ul style="list-style-type: none"> • fast access time • physically robust/no moving parts (to handle vibrations) • large memory capacity (for maps/routes) • Less power usage (less drain on battery) <p>1 mark for 1 bullet point</p>	1 PS	
18.	(h)	<ul style="list-style-type: none"> • Operating system is not loaded from backing storage • OS held in firmware/ROM at all times <p>1 mark for 1 bullet point</p>	1 PS	
19.	(a)	<ul style="list-style-type: none"> • Component blocks of a file are scattered on a hard disc (1 mark) resulting in slow load/times due to read/head requiring many placements (1 mark) • Free storage blocks are scattered (1 mark) resulting in slow write times due to write head requiring many placements (1 mark) <p>1 mark for each part of one bullet point</p>	2 KU	

Question			Expected Answer(s)	Max Mark	Additional Guidance
19.	(b)	(i)	Camouflage	1 KU	
19.	(b)	(ii)	<ul style="list-style-type: none"> Virus signature (1 mark) – Scans/searches for specific bit patterns stored in a database but bit pattern of payload is being continually altered (1 mark) <p>OR</p> <ul style="list-style-type: none"> Checksum (1 mark) would not detect since the original checksum would be the same as the load time checksum since the virus was present at installation time (1 mark) 	2 PS	
19.	(b)	(iii)	<ul style="list-style-type: none"> Heuristic (1 mark) – watching for behaviours associated with viruses (1 mark) Checksum (1 mark) - the morphing of the virus could result in a different file size (1 mark) <p>Note: checksum is not acceptable if given in (b) (ii) as Question states “other”</p>	2 PS	
20.	(a)	(i)	Declarative (1 mark)	1 PS	Do not accept Prolog
20.	(a)	(ii)	<ul style="list-style-type: none"> Uses facts and rules No variable types Uses pattern matching/in-built search Allows recursion/inheritance Rules may be used instead of multiple facts Knowledge is separated from its processing (ie lack of control structures) Any other valid <p>1 mark for any bullet point</p> <p>Note: credit should be given for appropriate response to incorrect part (i)</p>	1 KU	
20.	(b)		<ul style="list-style-type: none"> Provides tools for creation of GUI Code for buttons etc is done for the programmer/code tied to buttons Allow for user interactivity/control of program <p>1 mark for 1 bullet point</p>	1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
20.	(c)		<p>Continue to break down into sub problems (1 mark)</p> <ul style="list-style-type: none"> • Until they can be solved easily/trivially/simple <p>OR</p> <ul style="list-style-type: none"> • there is a 1:1 correspondence between pseudocode and code <p>(1 mark)</p>	2 KU	
20.	(d)		<ul style="list-style-type: none"> • Each separate IF will be checked even after a match is found (1 mark) • CASE selection condition will only be checked until a match is found then no further checks are made (1 mark) <p>Candidates who may have used PHP, Java and similar languages may refer to multiple conditions being met and use of break command to exit. They should be awarded appropriate marks</p>	2 PS	
20.	(e)	(i)	<ul style="list-style-type: none"> • When learning a new language • When developing code • When only wants to use a program once • When implementing/testing/maintaining <p>1 mark for any bullet point</p>	1 PS	
20.	(e)	(ii)	<ul style="list-style-type: none"> • Compiler is not required in memory (just the object code) when program is running (1 mark) • Interpreter must be in memory (along with source code) when program is running (1 mark) 	2 PS	
20.	(e)	(iii)	<ul style="list-style-type: none"> • Compiler: processor translates each line in the loop once (1 mark) • Interpreter: processor translates each line in the loop 50 times (1 mark) 	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
20.	(f)	(i)	<ul style="list-style-type: none"> Name of module Description of purpose Note of required parameters (with types, etc) Order of parameters Date written Source language Author/developer Listing of code/Structured Listing Any other valid <p>1 mark for any two bullet points</p>	2 KU	
20.	(f)	(ii)	<ul style="list-style-type: none"> Already designed/written/tested, saving time Can create program outside own skills <p>1 mark for 1 bullet point</p>	1 KU	
21.	(a)		<ul style="list-style-type: none"> Value of result can be either true or false Boolean variables can only be true or false Boolean is more memory efficient Result can only have two values/states <p>1 mark for 1 bullet point</p>	1 PS	Accept two state answers: Yes/No, 0/1, Pass/Fail
21.	(b)		<pre> Set counter to 0 Set result to false For 6 times IF laptime < 30 Add 1 to counter End if End loop If counter >= 4 Set result to true End if </pre>	5 PS	<p>1 mark for initialisation of both variables</p> <p>Note: result may be set explicitly to either true or false in final condition statement rather than a specific initialisation</p> <p>1 mark loop with clear, correct termination 1 mark IF with condition and clear termination 1 mark for increment</p> <p>Accept =</p> <p>1 mark for IF with condition and assignment and clear termination</p> <p>Note: Correct indentation can be taken as indication of termination</p>
21.	(c)	(i)	<ul style="list-style-type: none"> Memory – no second copy of array to store/stores pointer to array (1 mark) Processor – time not spent making second copy (1 mark) 	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
21.	(c)	(ii)	<ul style="list-style-type: none"> Result may be altered in the module the changed value is used elsewhere in the program <p>1 mark for any bullet</p>	1 PS	
21.	(d)	(i)	The module/subroutine/procedure which the variable is declared in (1 mark)	1 KU	
21.	(d)	(ii)	<ul style="list-style-type: none"> Variables cannot be accidentally altered by other parts of the program Variables will not conflict with variables with the same name in other modules Aids maintainability / improves readability Aids modularity Memory is released once subprogram is used <p>1 mark for any 2 bullet points</p>	2 PS	Accept "less memory"/"saves memory" for bullet 5
21.	(e)	(i)	<ul style="list-style-type: none"> Testing of software as thoroughly as possible Use of normal, extreme and exceptional data <p>1 mark for 1 bullet point</p>	1 KU	Not appropriate to switch marks between (e)(i) and (e)(ii)
21.	(e)	(ii)	<ul style="list-style-type: none"> Testing done in a planned/logical/ordered way Testing of each procedure separately and then the entire program <p>1 mark for 1 point</p>	1 KU	
21.	(f)		Perfective (1 mark)	1 KU	

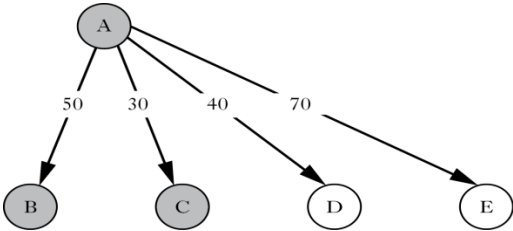
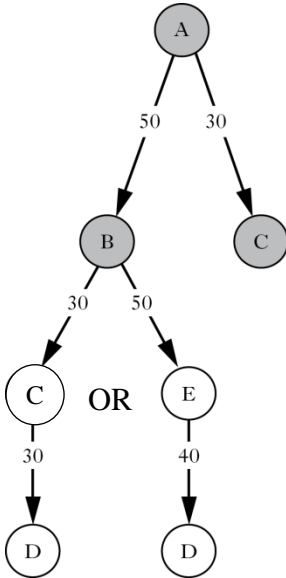
[END OF SECTION II]

SECTION III – Part A – ARTIFICIAL INTELLIGENCE

Question		Expected Answer(s)	Max Mark	Additional Guidance
22.	(a)	The ability of a computer/machine/program to carry out a task which would be deemed intelligent if carried out by a human (1 mark)	1 KU	Need definition not examples
22.	(b) (i)	<ul style="list-style-type: none"> • Problem solving • Adaptability • Memory • Machine learning/Ability to learn <p>1 mark for one bullet point</p>	1 PS	
22.	(b) (ii)	<p>Problem solving/Adaptability:</p> <ul style="list-style-type: none"> • Program is deciding which move to make <p>Memory:</p> <ul style="list-style-type: none"> • Program retains results from previous games and uses them to decide on next move <p>Machine Learning:</p> <ul style="list-style-type: none"> • Learning player strategies and how to compensate for them • Learning moves/strategies that lead to success <p>Any other valid explanation relating to answer given in (i)</p> <p>1 mark for one valid point relating to answer in (i)</p>	1 PS	
22.	(c)	Program is simply carrying out instructions given to it by the programmer (1 mark)	1 PS	
22.	(d)	<ul style="list-style-type: none"> • Multiple processors • can evaluate different moves simultaneously • reduce search time • <p>1 mark each any two bullets</p>	2 PS	
22.	(e)	<ul style="list-style-type: none"> • Increased memory – more facts/code can be manipulated/stored • Increased cache – frequently accessed routines stored to improve response times • Increased backing storage capacity – larger knowledge bases and programs can be stored/a bigger range of features to be created (and stored) within the program code • Faster processors/clock speed – generating faster response times <p>1 mark for advance, 1 mark for improvement from any bullet point</p>	1 KU 1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
23.	(a)		<ul style="list-style-type: none"> Limited/narrow/restricted area of knowledge Advice would be clearly defined based on inputs Clear guidelines/boundaries available <p>1 mark for 1 bullet point</p>	1 PS	
23.	(b)	(i)	<ul style="list-style-type: none"> Inference engine (1 mark) User interface (1 mark) 	2 KU	<p>Accept explanatory interface rather than user interface.</p> <p>All three components (ie inference engine, user interface, knowledge base) of expert system stated, 1 mark only</p>
23.	(b)	(ii)	Knowledge base (1 mark)	1 KU	
23.	(b)	(iii)	<ul style="list-style-type: none"> Development time will be reduced/skill level of developers can be lower (1 mark) since inference engine and user interface are already coded/tested (1 mark) Consistent user interface available (1 mark) without the need for complex programming (1 mark) Justification facilities available (1 mark) to improve quality of testing (1 mark) <p>2 marks for any one bullet point as allocated</p>	2 PS	
23.	(c)	(i)	<p>To explain reasoning :</p> <p>Why it is asking a particular question (1 mark)</p> <p>How it arrived at its conclusion (1 mark)</p>	2 KU	How/Why with no explanation: no marks
23.	(c)	(ii)	<ul style="list-style-type: none"> Allows checking of logic leading to advice Allows user to judge whether to take advice based on reasoning/User confidence in advice improved Improved training for bank staff (can try out hypothetical situations) Testing during the development process Any other valid <p>1 mark each for any 2 bullet points</p>	2 PS	

Question		Expected Answer(s)	Max Mark	Additional Guidance
24.	(a)	<p>Note: explanation is required</p> <ul style="list-style-type: none"> • Robustness – strengthened against damage • Ability to move over varying surfaces • Power supply/battery life – rechargeable not umbilical • Positioning of vision system/type of vision system • Physical size – large enough to carry luggage/small enough to be manoeuvrable • Weight – sturdy enough to carry out task but not too heavy to move once loaded • Hazzard awareness – warn public of presence of robot • Collision prediction/detection – to prevent collisions with people/objects • Any other valid problem <p>1 mark for each of two bullet points</p>	2 PS	
24.	(b)	<ul style="list-style-type: none"> • Decide whether an object is luggage or not (1 mark) to identify possible threats (1 mark) • Choosing a route round the airport/check-in queue (1 mark) to find an alternative route if obstacle encountered (1 mark) • Any other valid <p>2 marks for a suitable description with two clear points 1 mark for simply stating a task</p>	2 PS	
24.	(c)	<ul style="list-style-type: none"> • Signal processing (1 mark) • Edge detection (1 mark) <p>Note: order not important</p>	2 KU	
24.	(d)	<p>Failure to recognise an object due to:</p> <ul style="list-style-type: none"> • Varying shapes/sizes/styles of luggage • Range of objects which are not in its stored set of images • Image acquired from a different angle • Shadows distorting image • Similarities between objects (eg waste bin/large suitcase; colour/texture on adjacent objects) • Overlapping objects distorting image • Any other valid <p>1 mark for each of two bullet points Note: Reasons for “failure to recognise” are needed</p>	2 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
24.	(e)	<ul style="list-style-type: none"> • If the robot injures anyone -- who is responsible? • If the robot causes damage to luggage – who is responsible? • Any other valid <p>1 mark for 1 bullet point</p>	1 PS	
24.	(f)	<ul style="list-style-type: none"> • Weights initially set and applied to links • Output compared to expected output • Weights adjusted • Until expected output achieved/thresholds met <p>1 mark each of three bullets</p>	3 KU	Thresholds are not adjusted once set
25.	(a)	 <p>Note: order of D and E is not important</p> <p>1 mark for <u>two</u> correct nodes 1 mark for <u>two</u> correct distances Note: Award 1 mark for 1 correct node and its correct distance</p>	2 PS	
25.	(b)	 <p>1 mark for two correct nodes in correct order (C,D OR E,D) 1 mark for two correct distances</p>	2 PS	Two correct depth first nodes with correct distances added to incorrect diagram in part (a) award 2 marks

Question		Expected Answer(s)	Max Mark	Additional Guidance
25.	(c)	<ul style="list-style-type: none"> Only current path is stored/redundant nodes not stored When branch has been exhausted backtracking occurs In breadth first whole tree is stored (to current state) <p>1 mark for one bullet point</p>	1 KU	Uses less memory is a minimal acceptable answer
25.	(d)	Two routes may have the same total distance but are simply the reverse of each other (1 mark)	1 PS	
25.	(e)	Combinatorial explosion (1 mark)	1 PS	
25.	(f)	<p>Heuristic search (1mark)</p> <ul style="list-style-type: none"> Uses an evaluation function to determine which node is most likely to lead to a solution Reduces the number of nodes which must be visited Avoids paths which are unlikely to lead to a solution <p>1 mark for 1 description from list</p>	2 PS	Do not accept "common sense" or "rule of thumb" responses
26.	(a)	(i) No / False (1 mark)	1 PS	
26.	(a)	(ii) From (i) NOT(No/False) would be Yes/True 1 mark	1 PS	No marks for generic description of NOT operator
26.	(b)	<ul style="list-style-type: none"> Matches 7, Y is instantiated to rootstalks, <u>Y=rootstalks</u> (first solution) Matches 8, X is instantiated to oxeye_daisy, subgoal is <u>a(oxeye_daisy, Z)</u> Matches 2, Z is instantiated to chamomile, subgoal <u>has (chamomile, Y)</u> Matches 8, X is instantiated to chamomile, subgoal is <u>a (chamomile, Z)</u> Matches 1, Z=aster, subgoal <u>has (aster, Y)</u> Matches 5, Y is instantiated to flower_clusters, <u>Y=flower_clusters (second solution)</u> <p>1 mark for each of 6 underlined points 1 mark for single correct use of instantiate (d)</p>	7 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
26.	(c)	(i)	Inheritance/recursive (1 mark)	1 KU	
26.	(c)	(ii)	<ul style="list-style-type: none"> Reduces the number of facts required Do not need to include all dependencies when adding new facts <p>1 mark for 1 bullet point</p>	1 KU	Don't accept "saving time"

[END OF SECTION III – PART A]

SECTION III – Part B – COMPUTER NETWORKING

Question			Expected Answer(s)	Max Mark	Additional Guidance
27.	(a)	(i)	193.101.232.145 (1 mark)	1 PS	Note: Allow for copying error but not in first octet (193)
27.	(a)	(ii)	The first octet is in the range for class C (192 to 223)/Position of first 0 in binary conversion of 193 is in third position so Class C (11000001) (1 mark) Each octet must be in the range 1 to 255/256 is not an eight-bit number (1 mark)	2 PS	
27.	(b)	(i)	An (agreed) set of rules/instructions (1 mark) Any one of: <ul style="list-style-type: none"> • for transmission of data • for communication between devices • for format of data transfer (1 mark)	2 KU	
27.	(b)	(ii)	Telnet (1 mark)	1 KU	
27.	(b)	(iii)	FTP (1 mark)	1 KU	
27.	(c)		<ul style="list-style-type: none"> • Time is taken to check if the line is free/busy • A random amount of time is waited before attempting to re-transmit (if a collision occurred) • Data has to be re-transmitted (if a collision occurred) • Repeat collisions increase random wait time 1 mark for each of any 2 bullet points	2 PS	
27.	(d)		<ul style="list-style-type: none"> • Universal standard • Ensures compatibility of the equipment hardware and software • Allows hardware and software from different manufacturers/equipment to be connected. • Provides a common language to explain network components and their functionality • Standardises the transmission of data between computer systems on networks • Maintenance/Future updates can be carried out on individual layers 1 mark for any 1 bullet point	1 PS	

Question		Expected Answer(s)	Max Mark	Additional Guidance
27.	(e)	<ul style="list-style-type: none"> • Transmission Control Protocol (TCP) • UDP • SCTP • DCCP • SPX <p>1 mark for 1 protocol name or abbreviation</p>	1 PS	Answers which refer to IP (eg TCP/IP) are incorrect as IP operates at network layer
27.	(f)	<ul style="list-style-type: none"> • Spooling is used/Print Cache is used • This temporarily stores the print job (on backing storage) • until the printer is ready to receive it/print job needs to be resent <p>1 mark for each for two bullet points</p>	2 PS	
27.	(g) (i)	<pre> <html> <head> <title> Gym For Kids </title> </head> <body> <center> <p>Top Tips</p> <p>Perseverance </p> </center> </body> </html> </pre> <p>1 mark for the title tag line (opening, closing and Gym For Kids text) 1 mark for center align text (closing tag not required) 1 mark for blue colour text (closing tag not required)</p>	3 PS	<p>Centering text <center> <.. align="center" <.. style="text-align: center"</p> <p>Blue text: <font color="blue" <.. style="color: blue"</p> <p>Accept answers which combine style tag eg <.. style="text-align: center; color: blue"</p> <p>Must have opening tag for align or style eg: <p align="center" <div align="center" <div style="
 <h1 style="
 and alternatives</p> <p>Accept HEX values for colour blue eg #0000XX where XX is any HEX value</p> <p>Ignore spelling and incorrect capitalisation</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance
27.	(g)	(ii)	<p><code>Online Shop</code></p> <p>1 mark for <code><a href =</code> 1 mark for <code>"http://www.gymforkids.shop">Online Shop</code></p> <p>(Note: There must be some text to link to, but "<i>Online Shop</i>" is changeable)</p>	2 PS	<p>Allow candidates to omit <code>http://</code> from URL in href property</p> <p>Allow candidates to omit open and close quotes ("<code>"</code>) from around URL in href property</p>
27.	(h)	(i)	<ul style="list-style-type: none"> • A spider travels from one link to another on the web • gathering/indexing information/adding to database <p>1 mark for 1 bullet point</p>	1 KU	
27.	(h)	(ii)	<ul style="list-style-type: none"> • A meta-search uses multiple search engines (and results summarised in a list) <p>1 mark</p>	1 KU	
27.	(h)	(iii)	<p>Add a meta tag (1 mark) with relevant keywords added to it (1 mark)</p> <p>(Note: award full marks if a correct line of HTML code is given, for example: <code><meta name="keywords" content="Gym, Kids, Children, Glasgow"></code>)</p>	2 PS	
28.	(a)		<p>Provide a secure socket layer/protocol/https (1 mark) to encrypt the data/make it unreadable to hackers (1 mark)</p> <p>OR</p> <p>Use a secondary payment processing website (PayPal)/secure 3rd party payment service (1 mark) so that club website never actually sees the bank details (1 mark)</p>	2 PS	
28.	(b)	(i)	<p>Odd Parity (1 mark) 1100 1001/2nd byte (1 mark)</p>	2 PS	
28.	(b)	(ii)	<ul style="list-style-type: none"> • Parity check will not pick up if two bits are flipped • A cyclic redundancy check can detect any number of errors • Parity may differ between two machines (and cause problems) • Any other valid reason <p>1 mark for each of 2 bullet points</p>	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
28.	(c)		<ul style="list-style-type: none"> The bank data is divided into packets Each packet is given a header/address/sequence number Each individual packet is then routed/sent over the network At the destination the packets are reassembled (using their sequence number) <p>1 mark for each of 4 bullet points</p>	4 KU	
28.	(d)	(i)	<ul style="list-style-type: none"> Attacks which consume so many network resources (such as processors, disk space, memory, network connections, modems) that there is none left for legitimate users An attempt to shut down a server by targeting it with network traffic <p>1 mark for 1 bullet point</p>	1 KU	Accept examples of DOS attacks
28.	(d)	(ii)	<ul style="list-style-type: none"> Determining the nature of the attack Cost of repair and response to the attack Loss of sales Devising and implementing safeguards for the future Any other valid <p>1 mark for each of 2 bullet points Note: answers such as “<i>loss of confidence</i>” is not a cost, unless justified</p>	2 KU	
28.	(e)		A mirror disk/RAID (1 mark)	1 KU	
28.	(f)		<ul style="list-style-type: none"> Use of anti-virus software Use a firewall Use of fault tolerance components Use of uninterrupted power supply Regular maintenance/Disk monitoring for possible malfunctions/Run regular diagnostic tests Any other valid technique <p>1 mark for any bullet Note: answer must relate to a disaster avoidance technique and not a recovery technique</p>	1 KU	

Question		Expected Answer(s)	Max Mark	Additional Guidance
28.	(g)	<ul style="list-style-type: none"> • Inappropriate personal contact online • Access to inappropriate content • Excessive use of the forum/lack of face-to-face communication • Information that is available to advertisers about their online behaviour • Reputation management/How their child is treated by others online/Online bullying • Impact of “digital footprint” on future activities • Security issues eg malware, compromised personal details • Any other suitable <p>1 mark for each of 2 bullet points</p>	2 PS	
29.	(a)	<ul style="list-style-type: none"> • Allocate different levels of user/access rights • Set up multi-level access • Change permissions set for different staff • Any other valid explanation <p>1 mark for 1 bullet point</p>	1 PS	
29.	(b)	<p>The firewall would:</p> <ul style="list-style-type: none"> • monitor all communication ports • check IP/MAC address • allow access according to access control list 	2 PS	Accept statements such as “blocks access” for bullet three User related answers are not acceptable
29.	(c)	<p>$(32 / 8) * 1024 = 4096$ kilobytes/s (1 mark) $744 / 4096 = 0.18$ seconds (1 mark)</p> <p>OR</p> <p>$744 / 1024 * 8 = 5.8125$ megabits (1 mark) $5.8125 / 32 = 0.18$ seconds (1 mark)</p> <p>OR</p> <p>$744 * 8 = 5952$ kilobits $32 * 1024 = 32,768$ kilobits/s (1 mark for both conversions) $\Rightarrow 5952 / 32768 = 0.18$ seconds (1 mark)</p>	2 PS	1 mark for resolving units 1 mark for division with correct units Correct answer only award 2 marks

Question			Expected Answer(s)	Max Mark	Additional Guidance
29.	(d)	(i)	<ul style="list-style-type: none"> • Orders will be available to be dealt with quickly/food will come quicker • Reduce consumable costs • Drink orders can be dealt with before waiter leaves table with food order • Orders will not be lost • No misreading of orders • Waiters do not need to leave the restaurant floor • Customer bill sent straight to till/POS • Menu items which are currently unavailable can be identified at time of ordering • Any other valid <p>1 mark for any two valid points (Max 2 marks)</p>	2 PS	
29.	(d)	(ii)	<ul style="list-style-type: none"> • Staff errors due to lack of training/knowledge • Could be affected by interference/network failure • Out of range • Battery power will go down • Any other valid <p>1 mark for 1 valid bullet point</p>	1 PS	
29.	(e)	(i)	<ul style="list-style-type: none"> • It converts data into a form that can be broadcast on the network • It sends and receive signals to and from a router/access point • It buffers data • It converts voltages • Packages data into frames • Data Conversion • Auto-sensing • Any other valid <p>1 mark for 1 bullet point</p>	1 PS	
29.	(e)	(ii)	To uniquely identify a computer/device on the network (1 mark)	1 KU	
29.	(f)		WAP/Wireless Application Protocol (1 mark) HTTP(S)/Hypertext transfer protocol	1 KU	

[END OF SECTION III – PART B]

SECTION III – Part C – MULTIMEDIA TECHNOLOGY

Question			Expected Answer(s)	Max Mark	Additional Guidance
30.	(a)		<ul style="list-style-type: none"> To apply rollover effects (1 mark) To keep track of the number of hits (1 mark) To facilitate the completion of forms (1 mark) To activate animated sequences (1 mark) Any other valid <p>Note : There are many possible answers 1 mark for each of 2 bullet points</p>	2 PS	Need to describe specific examples including effect/purpose
30.	(b)	(i)	<ul style="list-style-type: none"> Re-Sampling Increased Resolution <p>1 mark for 1 bullet point</p>	1 PS	
30.	(b)	(ii)	<ul style="list-style-type: none"> Added pixels to increase the resolution (1 mark) Applies an algorithm to determine which colour the new pixels should be (1 mark) 	2 PS	
30.	(c)	(i)	<ul style="list-style-type: none"> Key Bytes store the colour of the pixel/stores colour of pixel to repeat (1 mark) As well as the number of repetitions of each colour/stores number of pixels to repeat for (1 mark) 	2 KU	Accept example of pattern representation
30.	(c)	(ii)	If there is a lot of variation in colour from pixel to pixel so that there are few (or only short) runs of the same colour (1 mark)	1 PS	“a lot of colours” requires more explanation – needs to refer to distribution/similar blocks
30.	(d)	(i)	CLUT/Colour Look-up Table (1 mark)	1 PS	
30.	(d)	(ii)	<ul style="list-style-type: none"> A colour look up table would contain a pre-defined subset of colours/RGB codes for a subset of colours (1 mark) The look-up table would be referenced every time the image is loaded (1 mark) 	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
30.	(e)		<ul style="list-style-type: none"> • Ensure that the images are uploaded to a specific stand-alone folder/directory • Code the page to preload images • Optimise images/compression/reduce pallet/colour/reduce file size • Correct the link to point to correct location of image • Embed the image as part of the web page/create an embedded file • Any other valid <p>1 mark for 1 bullet point</p>	1 PS	
31.	(a)		$16 \times 2 \times 44100 \times 45 = 63504000 \text{ bits}$ $= 7.57 \text{ Megabytes}$ <p><i>Note : If final answer is stated as 7.57 Mb with no working then all 3 marks must still be awarded</i></p>	3 PS	<p>1 mark for identifying stereo sound as 2 channels</p> <p>1 mark for $16 \times 2 \times 44100 \times 45$</p> <p>1 mark for correct answer in appropriate units</p>
31.	(b)	(i)	ADPCM (1 mark)	1 PS	
31.	(b)	(ii)	<ul style="list-style-type: none"> • Saves the first complete sample (1 mark) • Only stores changes in samples (so achieving compression) (1 mark) 	2 KU	
31.	(c)	(i)	<ul style="list-style-type: none"> • The sound file has been captured beyond the set dynamic range (1 mark) • Meaning that part of the sound is lost (1 mark) 	2 KU	
31.	(c)	(ii)	<ul style="list-style-type: none"> • Decrease amplitude/volume of source signal • re-recording anthem <p>1 mark for 1 bullet</p>	1 PS	
31.	(d)		Fade Out (1 mark)	1 PS	Fade on its own – too vague

Question			Expected Answer(s)	Max Mark	Additional Guidance
31.	(e)	(i)	MIDI cannot support vocal recordings (1 mark)	1 PS	
31.	(e)	(ii)	<ul style="list-style-type: none"> • Can edit attributes of each note (1 mark) • Can apply different effects to each channel (1 mark) • Can send notes to specific channels (1 mark) • Any other valid 1 mark for any point	1 KU	
31.	(e)	(iii)	Pitch (1 mark)	1 PS	
32.	(a)		<ul style="list-style-type: none"> • Light passes through RGB filters • Light reaches charged couple devices • Analogue charge/voltage is created for the image • ADC converts charge to digital value (for storage) 1 mark for each of three bullet points	3 KU	
32.	(b)		<ul style="list-style-type: none"> • Improved Processor capability – resulting in application of effects (Digital Signal Processing) • Increased RAM capacity/reduced latency – resulting in the storage of large clips in working memory • Increased capacity of (backing) storage – to hold video clips • Improved battery performance – allows higher power consumption to enable video capture. • Introduction of codec – to support video processing/compression • Any other valid 1 mark for the advance in technology 1 mark for the description from any bullet point	2 PS	<p>Advances in technology which allow advance from still images to moving images</p> <p>Smaller components/miniaturisation does not relate directly to recording</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
32.	(c)	<p> $1 \times 60 \times 24 = 1440$ frames (1 mark) 1440×24 (1 mark) $\times 26214400 = 905969664000$ Bits (1 mark) $37748736000/8 = 113246208000$ Bytes $4718592000/1024 = 110592000$ Kilobytes $4608000/1024 = 108000$ Megabytes $4500/1024 = 105.46875$ Gigabytes (1 mark) </p> <p>Accept rounding correctly to any number of decimal places (ie 105.5 Gb, 105.47 Gb, etc)</p> <p> 1 mark for determining number of frames 1 mark for bit depth of 24 (true colour) 1 mark for determining correct answer in bits 1 mark for working down to correct final answer </p> <p>If final answer alone is stated as 105.47 Gb with no working then all 4 marks must still be awarded</p>	4 PS	
32.	(d)	Higher throughput is needed (to ensure that the clip plays smoothly) (1 mark)	1 PS	Allow expressions which indicate processing more bits per second
32.	(e)	<ul style="list-style-type: none"> Each key frame is stored (1 mark) as a jpeg/using lossy compression (1 mark) Only changes between frames are stored (delta frames) (1 mark) 	3 KU	
32.	(f)	As it contains both audio and video (within one file) (1 mark)	1 PS	Do not accept generic description of container file
32.	(g)	<ul style="list-style-type: none"> An AVI file stores video and audio as an interleaved file/as linked components (1 mark) You cannot edit audio without converting the file into another format first to separate it from the video (1 mark) 	2 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
33.	(a)		<ul style="list-style-type: none"> Easier to edit individual objects Scalable without loss in quality Print quality matches printer capability/resolution independent Allows layering Will need less memory/backing storage/generate smaller filesize Any other suitable <p>1 mark for each of 2 bullet points</p>	2 KU	
33.	(b)	(i)	<p>SVG (1 mark) Also accept SVGT, EPS, DXF or SVGB</p>	1 KU	
33.	(b)	(ii)	<p><circle cx = "150" A = "150" B = "40" fill="green" stroke="blue" stroke-width="5"/></p> <p>State the missing attributes for A and B.</p> <p>A = cy (1 mark) B = r (1 mark)</p> <p>Order of answer is not important</p>	2 PS	<p>Note: Accept reference to centre y co-ordinate for cy (eg 'centre-y' but not 'y' on it's own) and reference to radius (eg 'radius' or 'rad') for r</p> <p>Accept answer without A = or B =</p>
33.	(c)	(i)	<ul style="list-style-type: none"> VRML WML WRL xVRML 3DXML Any other suitable <p>1 mark for 1 point</p>	1 KU	
33.	(c)	(ii)	Texture (1 mark)	1 PS	

Question			Expected Answer(s)	Max Mark	Additional Guidance
33.	(d)	(i)	<ul style="list-style-type: none"> Because the range required cannot be supported by Bluetooth/Bluetooth has a short range (<10m) Slower transfer rate/lower bandwidth Any other valid explanation <p>1 mark for 1 bullet point</p>	1 PS	
33.	(d)	(ii)	Wi-Fi (1 mark)	1 PS	

[END OF SECTION III – PART C]

[END OF MARKING INSTRUCTIONS]