



2015 Computing

Advanced Higher

Finalised Marking Instructions

© Scottish Qualifications Authority 2015

The information in this publication may be reproduced to support SQA qualifications only on a non-commercial basis. If it is to be used for any other purposes written permission must be obtained from SQA's NQ Assessment team.

Where the publication includes materials from sources other than SQA (secondary copyright), this material should only be reproduced for the purposes of examination or assessment. If it needs to be reproduced for any other purpose it is the centre's responsibility to obtain the necessary copyright clearance. SQA's NQ Assessment team may be able to direct you to the secondary sources.

These Marking Instructions have been prepared by Examination Teams for use by SQA Appointed Markers when marking External Course Assessments. This publication must not be reproduced for commercial or trade purposes.

Part One: General Marking Principles for: Computing Advanced 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.
- (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 Advanced 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

Software Development and Developing a Software Solution

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	(a)		Project Proposal	1	
1	(b)	(i)	<p>Technical – suitability/spec of hardware to run system, existence of current software for on-line travel bookings (1 mark)</p> <p>Legal – investigation of laws concerning storage of customer details. (1 mark)</p>	2	<p>Must be a description to gain mark.</p> <p>Name not required</p>
1	(b)	(ii)	<p>It could assist them with decision-making by:</p> <ul style="list-style-type: none"> • providing suggestions of possible solutions (1 mark) • deciding not to go ahead if not appropriate (1 mark) • giving them a recommended solution where possible (1 mark) • cost-benefit analysis to identify breakeven point (1 mark) • Use results for project planning e.g. schedule feasibility for setting deadlines (1 mark) 	2	
1	(c)	(i)	physical specification OR I/P/O OR scope & boundaries OR System prospectus etc. (1 mark)	1	
1	(c)	(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • Legally binding document detailing exactly what is required (1 mark) • Additional demands NOT in ORD do not need to be met (1 mark) • Additional demands will require agreement and costing (1 mark) 	2	

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(d)	<ul style="list-style-type: none"> • Identification of subtasks – can run concurrently rather than linear fashion (2 marks) • Identification of subtasks allows allocation of tasks to several team members (-facilitates concurrency) (2 marks) • CPA – identifies all tasks that must be completed and by when (2 marks) • Use of Gantt/Pert charts – identify time dependencies, sequential & parallel activities (2 marks) 	2	
1	(e)	<ul style="list-style-type: none"> • (Source) code automatically created from design/models/UML etc (1 mark) • Automatic documentation generation (1 mark) • Generate models (UML) from source code (1 mark) 	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
2	(a)	(i)	TYPE booking Journey ID: String Date: String OR Date/Time Passenger ID: String Seat Number: Integer Ticket Cost: Real/Currency/single/float END TYPE 1 mark for type-end type with record identifier 1 mark for appropriate fields 1 mark for appropriate data types	3	
2	(a)	(ii)	Dim passenger(100000) as booking 1 mark for use of record data type 1 mark for correct number of indices	2	Must match candidates record name from (i)
2	(b)	(i)	<ol style="list-style-type: none"> 1. Get requireddate 2. Open (1,needs close See line 8) 3. Loop 100000 times (1, must have end) 4. If passenger().date = requireddate then (see line 1-must have used input here for the mark, 1 –must use variable and field) 5. Write passenger ().JourneyID, passenger ().PassengerID, passenger ().Seat Number (1 mark for Write, 1 for correct use of variables) 6. End if 7. End loop 8. Close Max of five marks	5	Must include specified data in write statement – do not penalise additional data Do not award open/close if inside loop.
2	(b)	(ii)	Insufficient space OR Insufficient access rights OR Incorrect pathname OR file path does not exist OR attempting to open an already open file OR file with that name already exists (1 mark)	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
2	(c)	(i)	Wrong number of arguments OR mismatch of data types when parameter passing (1 mark)	1	Not runtime error
2	(c)	(ii)	Arguments in wrong order, resulting in incorrect data being passed. Incorrect order of (calls to) procedures (1 mark)	1	
2	(d)		<p>Any one bullet from:</p> <ul style="list-style-type: none"> • Set BREAKPOINTS (1 mark) – used to stop execution of the program at pre-defined points (1 mark) • WATCHING a variable (1 mark) – used to inspect its contents during execution OR to compare expected values (1 mark) • Use of DRY RUN (1 mark) – manually stepping through the lines of code (1 mark) • Structured walkthrough (1 mark) – team member leads other through software (1 mark) 	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
3	(a)		<p>Any two from:</p> <ul style="list-style-type: none"> • Can choose a suitable data type for each 1-D array • More efficient to store data in a suitable data type eg score as integer compared to string • Operations can be defined for each data type 	2	
3	(b)	(i)	It must not contain duplicate values OR with duplicate values, it may not find the required one. (1 mark)	1	
3	(b)	(ii)	It needs to be sorted. (1 mark)	1	
3	(c)	(i)	<ol style="list-style-type: none"> 1. Ask for search_item 2. Set low to 1 (lowest index) 3. Set high to 120000 (highest index) 4. Start loop 5. Set middle to (low+high) div 2 6. If search_item<competitorname(middle) then 7. High = middle -1 8. Else 9. Low = middle + 1 10. End if 11. Loop until search_item = competitorname(middle) or low>high 	6	<p>1 mark for both initialisations (2 & 3)</p> <p>1 mark with loop and matching termination with condition, 1 mark for complex condition (4 & 11)</p> <p>1 mark for setting middle (5)</p> <p>1 mark for IF with condition and END IF (6 & 10)</p> <p>1 mark for the middle-1/middle+1 to match High/Low (7 & 8)</p> <p>1 mark for high/low being set matching the IF condition</p>
3	(c)	(ii)	<p>Line 6. Selection (1 mark) operator needs to change from < to > (1 mark)</p> <p>OR swap (1 mark) lines 7 & 9 (1 mark)</p>	2	

Question		Expected Answer(s)	Max Mark	Additional Guidance																																																
4	(a)	<p>Pass 2 1089 867 1010 1171 989 723 710</p> <p>Pass 3 1089 1010 1171 989 867 723 710</p> <table border="1"> <thead> <tr> <th></th> <th>P1</th> <th>P2</th> <th>P3</th> <th>P4</th> <th>P5</th> </tr> </thead> <tbody> <tr> <td>723</td> <td>867</td> <td>1089</td> <td>1089</td> <td>1089</td> <td>1171</td> </tr> <tr> <td>867</td> <td>1089</td> <td>867</td> <td>1010</td> <td>1171</td> <td>1089</td> </tr> <tr> <td>1089</td> <td>723</td> <td>1010</td> <td>1171</td> <td>1010</td> <td>1010</td> </tr> <tr> <td>710</td> <td>1010</td> <td>1171</td> <td>989</td> <td>989</td> <td>989</td> </tr> <tr> <td>1010</td> <td>1171</td> <td>989</td> <td>867</td> <td>867</td> <td>867</td> </tr> <tr> <td>1171</td> <td>989</td> <td>723</td> <td>723</td> <td>723</td> <td>723</td> </tr> <tr> <td>989</td> <td>710</td> <td>710</td> <td>710</td> <td>710</td> <td>710</td> </tr> </tbody> </table>		P1	P2	P3	P4	P5	723	867	1089	1089	1089	1171	867	1089	867	1010	1171	1089	1089	723	1010	1171	1010	1010	710	1010	1171	989	989	989	1010	1171	989	867	867	867	1171	989	723	723	723	723	989	710	710	710	710	710	2	
	P1	P2	P3	P4	P5																																															
723	867	1089	1089	1089	1171																																															
867	1089	867	1010	1171	1089																																															
1089	723	1010	1171	1010	1010																																															
710	1010	1171	989	989	989																																															
1010	1171	989	867	867	867																																															
1171	989	723	723	723	723																																															
989	710	710	710	710	710																																															
4	(b) (i)	<table border="1"> <thead> <tr> <th>Index</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>Unsorted</td> <td>723</td> <td>867</td> <td>-1</td> <td>710</td> <td>1010</td> <td>-1</td> <td>989</td> </tr> <tr> <td>Sorted</td> <td>1171</td> <td>1089</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Index	0	1	2	3	4	5	6	Unsorted	723	867	-1	710	1010	-1	989	Sorted	1171	1089	0	0	0	0	0	2																									
Index	0	1	2	3	4	5	6																																													
Unsorted	723	867	-1	710	1010	-1	989																																													
Sorted	1171	1089	0	0	0	0	0																																													
4	(b) (ii)	<ul style="list-style-type: none"> possible scores will be 0 or above (1 mark) Because on each pass we are identifying largest so must be a low value for descending sort (1 mark) (same data type) 	1																																																	
4	(c)	<ul style="list-style-type: none"> Compares 1 and 2, 1 and 3 and so on. (1 mark) If the second number is greater the numbers are swapped. (1 mark) Process repeats by comparing the second number with each other number in turn. (1 mark) 	3	Since order is specified condition must be expressed.																																																

Question			Expected Answer(s)	Max Mark	Additional Guidance																
5	(a)		<ul style="list-style-type: none"> Create a <u>class</u> for the goblin (1 mark) Define its properties & <u>methods</u> (1 mark) create as many <u>instances</u> of this class as level requires (1 mark) 	2																	
5	(b)		<ul style="list-style-type: none"> Create a new <u>subclass</u> for a level two goblin (1 mark) Which <u>inherits</u> all of the properties and methods of the superclass already defined for the level one goblin. (1 mark) 	2																	
5	(c)	(i)		3	Line 1 wrong – award 2 nd mark if goblin health down by 4 and opponent health unchanged, award 3 rd mark if opponent health down by 1 and goblin health unchanged,																
			<table border="1"> <thead> <tr> <th>opponent strike</th> <th>goblin.strike</th> <th>goblin.health</th> <th>opponent.health</th> </tr> </thead> <tbody> <tr> <td>70</td> <td>65</td> <td>7</td> <td>12</td> </tr> <tr> <td>85</td> <td>34</td> <td>4</td> <td>12</td> </tr> <tr> <td>78</td> <td>78</td> <td>4</td> <td>11</td> </tr> </tbody> </table>	opponent strike	goblin.strike	goblin.health	opponent.health	70	65	7	12	85	34	4	12	78	78	4	11		
opponent strike	goblin.strike	goblin.health	opponent.health																		
70	65	7	12																		
85	34	4	12																		
78	78	4	11																		
5	(c)	(ii)	Lines 11- <u>12</u> – <u>13</u> -14 (1 mark)	1																	
5	(c)	(iii)	Any opponent.health < goblin health (1 mark)	1																	

Question		Expected Answer(s)	Max Mark	Additional Guidance
6	(a)	<ul style="list-style-type: none"> stack overflow (- pushing to a full stack) (1 mark) stack underflow (- popping from an empty stack) (1 mark) 	2	
6	(b) (i)	<ul style="list-style-type: none"> Last item added is the first one out (LIFO) (1 mark) as operations are carried out, they are added to the top/ tail (1 mark) 'undo' causes the most recent operations to be removed from the top/tail (leaving the older changes) (1 mark) <p>(LIFO on own = 1 mark only)</p>	2	Part (i) and part(ii) – marks are transferable
6	(b) (ii)	<p>uses first-in-first-out so</p> <ul style="list-style-type: none"> operations would not be 'un-done' in the correct order (1 mark) older changes would be made before more recent (1 mark) <p>(FIFO on own = 0 marks)</p>	1	

[END OF SECTION I]

Section II

Part A- Artificial Intelligence

Question			Expected Answer(s)	Max Mark	Additional Guidance
7	(a)	(i)	The rules that are applied in finding the solution (1 mark)	1	
7	(a)	(ii)	<ul style="list-style-type: none"> Journey must start and end at the depot (1 mark) Each house must be visited only once (1 mark) 	2	
7	(b)	(i)	<p>1 mark for level 1 correct 1 mark level 2 correct 1 mark levels 3 & 4 correct</p>	3	
7	(b)	(ii)	<p>From left to right on above tree:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">22</div> <div style="border: 1px solid black; padding: 2px 10px;">25</div> <div style="border: 1px solid black; padding: 2px 10px;">23</div> <div style="border: 1px solid black; padding: 2px 10px;">25</div> <div style="border: 1px solid black; padding: 2px 10px;">23</div> <div style="border: 1px solid black; padding: 2px 10px;">22</div> </div> <p>1 mark for 6 correct distances DABCD and DCBAD 1 mark for both answers correct</p>	2	
7	(b)	(iii)	The houses are visited in reverse order (1 mark)	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
8	(a)	<ul style="list-style-type: none"> Each move has an expected payoff / evaluation function for each state (1 mark) Works out the move for a player which minimises the maximum loss that can be expected for player (1 mark) 	2	
8	(b)	<ul style="list-style-type: none"> Both players know the exact state of the game at all times. (1 mark) Any other valid (1 mark) 	1	
8	(c)	<p>Removing 1 token will give him the chance of a max payoff of 3 and a min payoff of 1. Since Player 2 will play to minimise his losses, he will take 3 tokens leaving Player 1 to take 1 token. (1 mark)</p> <p>Removing 2 or 3 tokens will result in Player 1 losing. (1 mark)</p> <p>Player 1 takes 1 token. (1 mark)</p>	3	

Question		Expected Answer(s)	Max Mark	Additional Guidance
9	(a)	Semantic net (1 mark)	1	
9	(b) (i)	A default value is a basic value applied to all members of a class (1 mark) A current value is a value specific to an instance which over-rides the default value (1 mark)	2	
9	(b) (ii)	Breads are usually leavened by yeast which is a default value. (1 mark) Flatbreads have no leavening, so 'none' is a current value which over-rides yeast. (1 mark)	2	
9	(c) (i)	has_ingredient(X, Y) IF sub-class (X, Z), has_ingredient (Z,Y). 1 mark for correct use of predicates 1 mark for correct use of arguments Accept answer with flour instead of Y. Accept :- instead of IF	2	
9	(c) (ii)	<ul style="list-style-type: none"> Less coding since all rules for instances do not have to be written (1 mark) Adding new instances requires less code since inherited characteristics do not all have to be programmed (1 mark) 	1	
9	(d)	<ul style="list-style-type: none"> The list is divided into a Head which is baguette and a tail which is [fruit, brioche, ciabatta, sourdough, granary, oatmeal] (1 mark) Brioche does not match with baguette. (1 mark) Head of Tail of list is 'fruit' which doesn't match with brioche. (1 mark) 	3	

Question			Expected Answer(s)	Max Mark	Additional Guidance
10	(a)		M > R (1 mark) In taking away M to double the number in the middle area, at least one container must be left so L has to be bigger than M (1 mark)	2	
10	(b)		<4, 4, 4> (1 mark)	1	
10	(c)	(i)	To inform choice of nodes (1 mark)	1	
10	(c)	(ii)	<ul style="list-style-type: none"> From node A, selects B as first node since it has the highest score out of B, C, D (1 mark) Nodes on agenda are now E, F, G, C, D. (1 mark) E has highest score so E is chosen. E is a goal state. (1 mark) 	3	
10	(c)	(iii)	In a depth-first search the same nodes (B and E) would be visited (1 mark) without the extra processing time needed to calculate the evaluation score for nodes. (1 mark)	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
11	(a)		<ul style="list-style-type: none"> Elicits responses to questions in order to establish facts (1 mark) Facts used to fire rules (1 mark) Collects responses in working memory until it has enough responses to give advice (1 mark) 	2	
11	(b)	(i)	There may be several rules any of which could be fired at any time. Conflict resolution gives a strategy to handle this. (1 mark)	1	
11	(b)	(ii)	<ul style="list-style-type: none"> Starts with hypothesis and collects facts to prove hypothesis (1 mark) Never have more than one rule to fire at a time (1 mark) 	2	
11	(c)	(i)	Gives a numerical measure of how likely the rule is to be true / several conclusions may be possible for a given set of conditions (1 mark)	1	
11	(c)	(ii)	The response to a condition may be uncertain (1 mark)	1	
11	(c)	(iii)	<p>Multiply the CF for the rule (1 mark) by the minimum value of the CFs for the conditions (1 mark)</p> <p>OR</p> $CF_{conc} = \underbrace{CF_{rule}}_{1 \text{ mark}} \times \underbrace{(\min(CF_{cond1}, CF_{cond2}, \dots))}_{1 \text{ mark}}$	2	
11	(d)		Compare current situation to a previous one (possibly in a different context) (1 mark) and apply the response to the current situation (1 mark)	2	

Question		Expected Answer(s)	Max Mark	Additional Guidance
12	(a)	<p>He received a red card</p> <p>noun phrase Verb phrase</p> <p>Pronoun (He) Verb (received) Noun phrase (a red card)</p> <p>article (a) adjective (red) noun (card)</p> <p>1 mark for correct identification of primary split into noun phrase and verb phrase 1 mark for correct primary decomposition of verb phrase 1 mark for correct decomposition of secondary noun phrase</p>	3	
12	(b)	<p>Without context, the meaning of the sentence is ambiguous. (1 mark) For example, is it referring to a football player, a red birthday card, a heart/diamond playing card etc</p> <p>(1 mark for showing ambiguity)</p>	2	

[END OF SECTION II – PART A]

Section II

Part B- Computer Architecture

Question		Expected Answer(s)	Max Mark	Additional Guidance
13	(a)	<ul style="list-style-type: none"> • The processor searches level 1 cache for the current instruction and retrieves if in there (1 mark) • If a cache misses, it checks in Level 2 – if there, it moves a block of code including the instruction to level 1 and retrieves from there (1 mark) • If not in level 2, it transfers a large block of code from main memory into level 2, then a smaller block to level 1 and retrieves from there (1 mark) 	3	
13	(b)	<ul style="list-style-type: none"> • Code loops consume most of the processing time and only a small amount of cache memory will be needed to store these (1 mark) • Cache memory is much faster than main memory (1 mark) 	2	
13	(c)	<ul style="list-style-type: none"> • Very expensive to provide cache which may make a larger cache version uneconomic (1 mark) • Cache needs to be searched to find the required data which may take too long compared with retrieving it straight from main memory if the cache is too large (1 mark) • The physical size of the larger cache may not fit onto the processor chip or other features may have to be left out (1 mark) <p>(Any two marks)</p>	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
14	(a)	(i)	<ul style="list-style-type: none"> Memory is split into 2 or 4 banks with memory addresses being sequential <i>across</i> the banks (1 mark) Whilst waiting for the data to be ready during a memory read/ write operation, the processor starts the next read/write operation which will be on the next bank (1 mark) Effectively, this means that memory on each bank is being accessed concurrently (1 mark) 	2	
14	(a)	(ii)	<ul style="list-style-type: none"> When writing data, there is no processing needed so there is no waiting period between writing data items. (1 mark) When reading programs from memory, the data that has been read may have to be decoded and processed and this may take a considerable time before the next item can be read losing the advantage of interleaved memory. (1 mark) 	2	
14	(b)	(i)	<ul style="list-style-type: none"> Hard drive issues a transfer request to the DMAC and when the CPU does not need to use the buses, it 'disconnects' from the buses. (1 mark) The DMAC now uses the buses to transfer data directly from the hard drive to memory. When transfer is complete or the CPU needs to use the buses again, the DMAC stops transferring data and returns the use of the buses to the CPU. (1 mark) 	2	
14	(b)	(ii)	<ul style="list-style-type: none"> Without DMA, the data is first moved from the hard drive to a register in the processor before being transferred to the memory. The CPU therefore has to spend its time doing the data transfer. (1 mark) With DMA, the data is transferred directly from hard drive to memory, usually whilst the CPU is doing processing tasks that do not need the use of the buses. (1 mark) 	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
14	(c)	(i)	To transfer data between the processor and peripherals. (1 mark)	1	
14	(c)	(ii)	<ul style="list-style-type: none"> • PCI-X has a higher (4x) bus clock rate (1 mark) • PCI-X has a wider bus width (2x) (1 mark) • PCI-X has a greater (8x) data throughput rate (1 mark) <p>Maximum 2 marks.</p>	2	
14	(c)	(iii)	All devices connected on the PCI-X bus will slow to that of the PCI device. (1 mark)	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
15	(a)	<ul style="list-style-type: none"> The processor may have microcode to simulate the original instruction set (1 mark) Include the legacy instructions in the current instruction set as well as legacy registers in the processor (1 mark) <p>Any valid answer for 1 mark.</p>	1	
15	(b)	(i) A large number of general purpose registers (1 mark)	1	
15	(b)	(ii) Registers are the fastest form of memory so using register oriented instructions with lots of GP registers means faster processing. (1 mark)	1	
15	(c)	(i) One of the pipelines may be doing a calculation that requires the result of a calculation that is being carried out in another pipeline and which isn't ready yet. (1 mark)	1	
15	(c)	(ii) <ul style="list-style-type: none"> The pipeline stages should all be of equal duration but this is unlikely to be achieved (1 mark) Branch instructions may cause the pipeline to stall (1 mark) Instructions may be of different lengths (1 mark) <p>Any 2 reasons for 2 marks.</p>	2	
15	(c)	(iii) <ul style="list-style-type: none"> Data flow analysis. (1 mark) The compiler scans the code looking for data dependency (1 mark) and rearranges the code to try to reduce it as much as possible when executing. (1 mark) <p>Max 2 marks</p>	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
15	(d)	(i)	Two pipelines are used. When a branch is detected entering a pipeline, both pipelines are used to load code for each of the possible paths (1 mark) and when the branch is actually executed, the pipeline storing the correct branch is used and the other is freed up. (1 mark)	2	
15	(d)	(ii)	There are no pipeline stalls because one of the pipelines will continue running with the correct branching. (1 mark)	1	
15	(d)	(iii)	With prediction, the branch is assumed to take the same path as the previous time it was encountered. (1 mark) The pipeline will therefore stall on the occasions when this path is not to be taken so performance will suffer. (1 mark)	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance																																																		
16	(a)	(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Line Number</th> <th>A</th> <th>X</th> <th>Result</th> <th>Valid</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>2</td> <td>0</td> <td>0</td> </tr> <tr> <td>2</td> <td>00001101</td> <td>2</td> <td>0</td> <td>0</td> </tr> <tr> <td>5</td> <td>00011010</td> <td>2</td> <td>0</td> <td>0</td> </tr> <tr> <td>6</td> <td>00011010</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>5</td> <td>00110100</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>6</td> <td>00110100</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>8</td> <td>00110100</td> <td>0</td> <td>00110100</td> <td>0</td> </tr> <tr> <td>9</td> <td>1</td> <td>0</td> <td>00110100</td> <td>0</td> </tr> <tr> <td>10</td> <td>1</td> <td>0</td> <td>00110100</td> <td>1</td> </tr> </tbody> </table> <p>1 mark for each of Line Number, A, X, Result and Valid columns. (5 marks max)</p>	Line Number	A	X	Result	Valid	1	0	2	0	0	2	00001101	2	0	0	5	00011010	2	0	0	6	00011010	1	0	0	5	00110100	1	0	0	6	00110100	0	0	0	8	00110100	0	00110100	0	9	1	0	00110100	0	10	1	0	00110100	1	5	
Line Number	A	X	Result	Valid																																																			
1	0	2	0	0																																																			
2	00001101	2	0	0																																																			
5	00011010	2	0	0																																																			
6	00011010	1	0	0																																																			
5	00110100	1	0	0																																																			
6	00110100	0	0	0																																																			
8	00110100	0	00110100	0																																																			
9	1	0	00110100	0																																																			
10	1	0	00110100	1																																																			
16	(a)	(ii)	The value stored in "Number" is being multiplied by 4. (1 mark)	1																																																			
16	(a)	(iii)	<ul style="list-style-type: none"> If the value in "Number" is greater than 63, lines 3 and 4 will ensure that 0 is stored in "Valid". (1 mark) A later section of the program could display an error message if "Valid" contains 0 because any larger value than 63 will result in an overflow. (1 mark) 	2																																																			
16	(b)	(i)	Line 6 - DEX (1 mark)	1																																																			
16	(b)	(ii)	Immediate mode (1 mark)	1																																																			
16	(c)		IR: this stores the opcode whilst it is being decoded by the control unit. (1 mark)	1																																																			
16	(d)		MDR: data being transferred to/from main memory is stored in this register which acts as buffer between the internal and external data buses. (1 mark)	1																																																			

Question		Expected Answer(s)	Max Mark	Additional Guidance
17	(a)	<p>Specific users can be given permission to read/write/delete a file (1 mark)</p> <p>Any other valid (1 mark)</p>	1	
17	(b)	<p>The size attribute can be compared with an expected file size to see if the file has been modified by a virus. (1 mark)</p> <p>Modified attribute can be checked to see whether file was illegally accessed. (1 mark)</p> <p>Any 2 valid answers</p>	2	
17	(c)	<p>For full backups, the archive attribute is not checked since all files are backed up. However, the attribute is reset after backing up each file. (1 mark)</p> <p>For differential backups, the archive attribute is checked to see whether it is set and if so, the file is backed up. (1 mark)</p>	2	

Question		Expected Answer(s)	Max Mark	Additional Guidance
18	(a)	Each process is stored in an area of memory that is large enough to store the entire process. (1 mark)	1	
18	(b)	<ul style="list-style-type: none"> The best fit method requires the entire memory to be scanned first in order to find the partition closest in size but larger than the process (1 mark) This is much slower than first fit where the first partition that is large enough is used (1 mark) Fragmentation will be a bigger problem (1 mark) because of a large number of small memory partitions created (1 mark) 	4	
18	(c)	This ensures that the operating system is in control so that each process will get a fair share of processing time (1 mark)	1	
18	(d)	<p>When a process changes from ready to running, the processor has to be set up in the state that it was the last time it was running. This takes a fixed amount of time and is wasted processing time. (The running state also has to be saved at the end of the time slice) (1 mark)</p> <p>So if the time slice period is reduced, the proportion of time 'wasted' in setting up and closing down the process will increase (1 mark) thereby reducing the apparent processor performance.</p>	2	
18	(e)	It may be a blocked process that is waiting for input/output to be completed. (1 mark)	1	
18	(f)	<p>In a multi-level feedback queue, new processes get very high priority for a short time. A cancel process is likely to be a short task and the task would therefore be acted on and probably completed immediately. (1 mark)</p> <p>In round robin scheduling, the 'cancel' process would have to wait its turn for service. (1 mark)</p>	2	

[END OF SECTION II- PART B]

Section II

Part C – Computer Networking

Question			Expected Answer(s)	Max Mark	Additional Guidance
19	(a)	(i)	<p>Accept two of the following:</p> <ul style="list-style-type: none"> ensures new hardware works with existing systems (1 mark) wide range of hardware vendors to choose from (1 mark) standards and their maintenance are well documented (1 mark) any other valid (1 mark) 	2	
19	(a)	(ii)	<p>Accept one of the following:</p> <ul style="list-style-type: none"> standards can result in suboptimal solutions (1 mark) difficult to tailor solutions to specific needs of company (1 mark) any other valid (1 mark) 	1	
19	(b)	(i)	<p>Accept two of the following:</p> <ul style="list-style-type: none"> Geneva office can access remote resources as if locally connected to head office network (1 mark) traffic encapsulated and therefore more secure (1 mark) any other valid (1 mark) 	2	
19	(b)	(ii)	data link (1 mark)	1	
19	(b)	(iii)	Network (1 mark)	1	
19	(b)	(iv)	L2TP (1 mark)	1	
19	(b)	(v)	<p>Accept two of the following:</p> <ul style="list-style-type: none"> Built-in encryption, rather than relying on encapsulated protocol. (1 mark) Supports more than a single point-to-point tunnel. (1 mark) Can be used on non-IP networks. (1 mark) 	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
20	(a)		<ul style="list-style-type: none"> • /18 indicates the portion of the address which refers to network (1 mark) • this leaves 14 (32-18) bits to be allocated to hosts on the network (1 mark) 	2	
20	(b)		<ul style="list-style-type: none"> • class based system allocates in three different fixed sized blocks (1 mark) • CIDR system allows variable sized blocks to be allocated (1 mark) • easier to allocate close to the number of addresses required (1 mark) • if network requires just a few addresses over a class C then they would need to be given a class B allocation (1 mark) • more IP addresses are wasted (1 mark) • any other valid (1 mark) 	3	
20	(c)	(i)	<ul style="list-style-type: none"> • Class B network is /16, first two octets used for network address (1 mark) • 64 subnets requires six extra bits for subnet mask, /22 (1 mark) • Subnet mask is 255.255.252.0 (1 mark) <p>1 mark for each point, maximum of three marks</p>	3	
20	(c)	(ii)	<ul style="list-style-type: none"> • IP address uses 32 bits, 22 used for subnet mask, 10 bits left for hosts on subnet (1 mark) • 2^{10} IP addresses per subnet (1 mark) • 2 addresses required for subnet and broadcast addresses (1 mark) • $2^{10} - 2 = 1022$ maximum allowable hosts (1 mark) <p>1 mark for each point, maximum of three marks</p>	3	

Question			Expected Answer(s)	Max Mark	Additional Guidance
21	(a)		<ul style="list-style-type: none"> connection opened by the client – typically via port 80 (1 mark) clients request specific resource – eg GET/index.html1 HTTP/1.1 (1 mark) server returns response code and headers – eg HTTP/1.1 200 OK (1 mark) server sends the requested data, connection can be closed by either the client or server (1 mark) 	4	
21	(b)	(i)	Accept one of the following: <ul style="list-style-type: none"> authenticate the server (1 mark) contain a public encryption key (1 mark) 	1	
21	(b)	(ii)	<ul style="list-style-type: none"> the client/server/recipient creates a private/public key pair (1 mark) the public key is shared with the server/client/sender (1 mark) sender encrypts data using recipient's public key (1 mark) cyphertext can be safely transmitted over open channel (1 mark) recipient decrypts data using their own corresponding private key (1 mark) <p>1 mark for each point, maximum of four marks</p>	4	
21	(c)	(i)	Accept one of the following: <ul style="list-style-type: none"> QuickTime (1 mark) Windows Media Player (1 mark) RealPlayer (1 mark) any other valid (1 mark) 	1	
21	(c)	(ii)	<pre>Study Guide</pre> <p>1 mark for anchor tag 1 mark for valid URL 1 mark for syntax</p>	3	

Question			Expected Answer(s)	Max Mark	Additional Guidance
21	(d)	(i)	Java applets (1 mark)	1	
21	(d)	(ii)	<ul style="list-style-type: none"> • operates within a sandbox (1 mark) • available on multiple platforms (1 mark) 	2	
21	(e)		<p>Accept any valid answer eg:</p> <p>Popup Menu, only pre-validated options can be chosen, lessening the chance that an error can occur</p> <p>1 mark for an acceptable element, 1 mark for suitable justification</p>	2	

Question		Expected Answer(s)	Max Mark	Additional Guidance
22	(a)	<p>Accept one of the following:</p> <ul style="list-style-type: none"> • Ping (1 mark) • Traceroute (1 mark) 	1	
22	(b) (i)	<ul style="list-style-type: none"> • originator sends SYN message to target server (1 mark) • message has spoofed IP address (1 mark) • server allocates resources for new connection (1 mark) • server sends SYN/ACK message to spoofed IP but gets no response (1 mark) • resources unallocated only after timeout expires (1 mark) 	4	
22	(b) (ii)	<ul style="list-style-type: none"> • increase size of connection buffer (1 mark) • reduce the length of time of the connection timeout (1 mark) • any other valid (1 mark) <p>1 mark for each point, maximum of two marks</p>	2	
22	(c) (i)	Full (1 mark)	1	
22	(c) (ii)	<p>Accept the following:</p> <ul style="list-style-type: none"> • Incremental (1 mark) • cannot be Full or A, B, and C would not have been needed (1 mark) • cannot be Differential or B, and C would not be needed (1 mark) <p>1 mark for each point, maximum of three marks</p> <p>incorrect terms with correct definitions -1 mark</p>	3	

Question			Expected Answer(s)	Max Mark	Additional Guidance
23	(a)	(i)	<ul style="list-style-type: none"> amount of data to transmit: $84 * 1024 * 1024 * 8 = 704643072$ bits (1 mark) rate = $54 * 1000 * 1000 = 54,000,000$ bits per second (1 mark) transfer time = amount / rate = 13.05 seconds (1 mark) 	3	
23	(a)	(ii)	<ul style="list-style-type: none"> devices at the edge of the usable range lacking signal strength (1 mark) physical obstructions in path between devices (1 mark) interference from other radio/electrical equipment (1 mark) any other valid (1 mark) <p>1 mark for each point, maximum of two marks</p>	2	
23	(b)	(i)	<ul style="list-style-type: none"> hidden SSID (1 mark) MAC address authentication (1 mark) WPA encryption (1 mark) 	3	
23	(b)	(ii)	<ul style="list-style-type: none"> roll out new measures to a small number of students (1 mark) request feedback of any issues found in testing (1 mark) 	2	

[END OF SECTION II- PART C]

[END OF MARKING INSTRUCTIONS]