



2012 Computing

Higher

Finalised Marking Instructions

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SECTION I

1.	585 (1 mark)		1 PS
2.	(a)	Exponent (1 mark)	1 KU
2.	(b)	Mantissa (1 mark)	1 KU
3.	<ul style="list-style-type: none"> • Each pixel represented as a binary number • As a (2D) <u>array/grid</u> of pixels • Colour (of pixel) represented by (unique) binary value/notion of bit depth (1 mark for each of two valid points)		2 KU
4.	<ul style="list-style-type: none"> • Voltage conversion • Data format conversion/serial to parallel/analogue to digital • Handling of status signals (accept a valid example) (Any two correct answers 1 mark each)		2 KU
5.	<ul style="list-style-type: none"> • (1) Registers • (3) RAM/ROM/Main Memory (1 mark each)		2 PS

6.	(a)	<p>The file management system will:</p> <ul style="list-style-type: none"> • Decide where on backing store the file will be saved • Allocate/record address of (start of) file (or blocks/parts thereof) • Ensure that file does not overwrite existing/valid data • Define access rights • Record the creation date • Update the file directory (regarding file or parts/blocks) • Any other valid <p>(1 mark each for any two correct answers) Note: many candidates make incorrect reference to “locating file”</p>	2 KU
	(b)	<ul style="list-style-type: none"> • Copies/transfers the blocks of <u>data</u> from main memory to the hard disk • Handles errors during data transfer • Inputting user commands for save via mouse click etc • Any other valid (1 mark) <p>Note: valid answer must relate to objects at lower level than file</p>	1 KU
7.	(a)	<p>Bus (Topology) (1 mark)</p>	1 PS
	(b)	<ul style="list-style-type: none"> • Better security/control of access • Efficient backup of centralised files • File/application sharing is simpler to set up • Any other valid (1 mark) 	1 KU
	(c)	<ul style="list-style-type: none"> • A router • A (cable) modem • Any other valid (1 mark) <p>Note: NIC is not valid, as this connects a device to the network only</p>	1 PS

8.	<ul style="list-style-type: none"> • The process may revisit an earlier stage (1 mark) • In the light of experience/information gained (1 mark) 	2 KU
9.	A problem is broken down into smaller/easier to solve (sub-)problems. (1 mark)	1 KU
10.	<ul style="list-style-type: none"> • Structure chart/diagram • Flowchart • Semantic net • Any other valid (1 mark for 1 point)	1 KU
11.	(a) Implementation/testing/maintenance (1 mark)	1 KU
	(b) Implementation: lines of code are translated and executed in turn, reporting syntax errors Testing: test all (or part) of code to help identify line where error occurs Maintenance: as above (1 mark for any valid explanation of use in stage named in (a)) Note: accept generic answer describing interpretation “translate and execute each line in turn”	1 PS
12.	<ul style="list-style-type: none"> • Scripting language is embedded within an application (1 mark) whereas a procedural is stand-alone (1 mark) • Keywords within a scripting language are specific to parent application (1 mark) whereas in a procedural, keywords are more general (1 mark) • Programmer has control over data types/might have access to low level commands/operations in a procedural language (1 mark) whereas data types are embedded in a scripting language (1 mark) (2 marks awarded as shown within any one point) Note : To state a difference by negating a valid statement is not enough for the second mark. Macros do not set these languages apart.	2 PS

13.	(a)	A variable which can have only 2 values - true/false (OR yes/no OR on/off) (1 mark)	1 KU
	(b)	<ul style="list-style-type: none"> • Used to terminate the loop • Used to show the presence of the item in the list (1 mark for one point)	1 PS
14.	<p>1 mark for one of the following definitions of reliable...</p> <ul style="list-style-type: none"> • Will give correct output to valid data • Will not stop due to design flaws/errors • Free from design and coding bugs <p>Robust software will not crash when invalid data is entered (or similar) (1 mark)</p> <p>Note: Candidates may use valid/correct interchangeably</p>		2 KU

15.	State one way in which documentation produced at the <i>testing</i> stage of the software development process will be used during <i>corrective maintenance</i> .	1 PS
	<ul style="list-style-type: none"> • <i>Will detail test data originally used so that re-testing on that data will not need to be done again</i> • <i>Details the original test data which did not find the error</i> • <i>Allows identification of new data sets that should be tested</i> <p>(1 mark for valid response)</p>	
16.	State two characteristics of programming code that improve <i>maintainability</i> .	2 KU
	<ul style="list-style-type: none"> • <i>Use of meaningful variable names</i> • <i>Use of internal comments</i> • <i>Effective use of white space (such as appropriate indentations and blank lines)</i> • <i>Use of procedures/modularity/subroutines/functions</i> • <i>Use of parameter passing/local variables</i> • <i>Use of module libraries</i> • <i>Use of formatted keywords</i> • <i>Any other valid</i> <p>(1 mark for each of two points)</p>	

SECTION II

17.	(a)	<ul style="list-style-type: none"> • Clock Speed does not take other important architectural features into consideration (such as data bus width) • Clock Speed is not a measure of actual throughput. • Clock Speed is only valid if the processors being compared have the same architecture. <p>(1 mark for any of the above)</p>	1 KU
	(b)	<ul style="list-style-type: none"> • FLOPS result may be more reliable as (logic/arithmetic) operations independent of level of complexity • Complexity of instructions used can vary (and therefore skew the results with MIPS) • MIPS test may have been performed with small/simple machine instructions <p>(1 mark for each of two points)</p>	2 PS
	(c)	<p>Addressable memory = $2^{32} \times 128$ (2 marks, 1 for each part)</p> <p>= 549755813888 bits = 68719476736 bytes</p> <p>= 67108864 Kbytes = 65536 Mbytes = 64Gbytes. (1 mark)</p>	3 PS
	(d)	<p>(i) Any valid, ie AND, OR, NOT, =, <, <=, >, >=, <>, etc (1 mark)</p> <p>Note: accept descriptions of above (“comparison of values”) or actual machine code instructions (BNE - Branch if not equal)</p>	1 PS
		<p>(ii)</p> <ul style="list-style-type: none"> • Synchronise processor instructions/operations • Control the flow of data/instructions within CPU • Activate and/or respond to control lines • Control fetch execute cycle • Decode and execute instructions. <p>(1 mark for any valid point)</p>	1 KU
	(e)	<p>More data can be carried in a single instruction cycle/at one time (1 mark)</p>	1 PS

18.	(a)	<ul style="list-style-type: none"> • Each computer on a network has its own built in processor/RAM/backing storage (1 mark) • A terminal is reliant on the processor/RAM/backing storage capacity of the mainframe (1 mark) • A mainframe will have many thousands of processors/massive ram space/backing storage (1 mark) • Much more than any individual computer on a computer network (1 mark) <p><i>(Valid point with reason, 2 marks)</i></p>	2 KU
	(b)	<p>(i)</p> <ul style="list-style-type: none"> • The available free space is fragmented, file fragments/space spread out over the disks • Large section of (contiguous) free space required to store the file <p>OR</p> <ul style="list-style-type: none"> • Disk contains unidentified bad sectors • These are unavailable for storing of data <p>OR</p> <ul style="list-style-type: none"> • Disk space used by copies of virus that does not show in file table • But these blocks are unavailable for storing data <p><i>(1 mark for each bullet in pair, other valid answers are possible)</i></p>	2 PS
		(ii) A defragmenter OR disk editor OR anti-virus (1 mark for software related to part (i))	1 PS
		(iii) Utility software/system utility/utility (1 mark)	1 KU
	(c)	<p>Copper/UTP/fibre optic/co-axial/wireless/WiFi (1 mark)</p> <p>Any valid reason (range/bandwidth/security) that allows at least 80 metres range with large files (1 mark)</p> <p>Note: Do not accept brand names such as Bluetooth, Ethernet</p>	2 PS
	(d)	<p>Address (of the data to be read) placed on the address bus (by the processor) (1 mark)</p> <p>The read line is set high/activated (1 mark)</p> <p>Data (from the memory location) transferred (to the processor) using the data bus (1 mark)</p> <p>Note: order must be correct for full marks, max two marks for correct steps in wrong order</p>	3 PS

19.	(a)	Unicode (1 mark) Unicode can represent all 3000 chars, ASCII can only represent up to 256/8 bit (1 mark) Note "double jeopardy"	2 PS
	(b)	<ul style="list-style-type: none"> • DPI/Resolution • Compatibility/interface • Buffer capacity • Speed/PPM • Physical size/portable (1 mark each of two) Note: Colour depth not relevant to context	2 KU
	(c)	(i) A file virus cannot infect a data file (1 mark) only an executable file (1 mark)	2 PS
		(ii) A virus is (self-)replicating code (1 mark)	1 KU
		(iii) Camouflage, watching, delivery, replication (any valid for 1 mark)	1 PS
	(d)	<ul style="list-style-type: none"> • <u>8 bit colour/8 bits per pixel/256 colours</u> • Bitmapped format • Transparency • (Lossless) compression {but not lossy compression} • Supports simple animation • Standard file format (high level of compatibility) (Any two valid answers, 1 mark each)	2 KU

20.	(a)	(i)	<ul style="list-style-type: none"> • (Interview client management) to establish <u>precisely</u> what is needed/ elicit details • (Interview current users of the system) to establish good/bad points of current system • Any other valid explanation <p>(1 mark for 1 point)</p>	1 KU
		(ii)	<ul style="list-style-type: none"> • Issue questionnaires • Make observation notes/observe current practice • Examine sources of information/company documentation <p>(1 mark for each of two valid points)</p>	2 KU
	(b)	(i)	<p>Software specification/program specification/ORD (1 mark)</p> <p>Note: requirement/system spec is too vague</p>	1 KU
		(ii)	<ul style="list-style-type: none"> • Formalises the <u>details</u> of the software to be produced • It will form part of a legal agreement/contract • If one of client's needs is omitted from the document, it will not be done as part of the initial contract • Additional features cannot be added into software without new contract <p>Any other valid reason</p> <p>(1 mark for each of 2 points)</p>	2 PS
	(c)		<ul style="list-style-type: none"> • Contribute to the provision of test data • Plan structure of testing to match boundaries/analysis • Validate test data to be used at testing stage • Validate test results against specification <p>Any other valid</p> <p>(1 mark for any valid response)</p>	1 PS
	(d)		<p>Since he has involvement with the project he doesn't qualify (1 mark)</p> <p>Note : 'he is not independent' needs qualification to get the mark</p>	1 PS
	(e)		<p>Systematic</p> <ul style="list-style-type: none"> • Tests individual subroutines, then modules, up to whole system testing • Methodical/logical/planned checking of software (1 mark) <p>Comprehensive</p> <ul style="list-style-type: none"> • Uses normal/extreme/exceptional data • Test software in as many cases as possible/full range (1 mark) 	2 KU
	(f)		<ul style="list-style-type: none"> • Project manager (1 mark) 	1 KU

21.	(a)	(1-D) Array (1 mark) of real (accept single/double/float) (1 mark)	2 PS
	(b)	<p> <i>tallest = height[1]</i> (see below for assignments) <i>name_of_winner = name[1]</i> <i>loop to end of list</i> (1 mark for loop with termination) <i>if height[position]>tallest then</i> (1 mark for IF and termination 1 mark for correct condition) <i>tallest = height[position]</i> (see below for assignments) <i>name_of_winner = name[position]</i> <i>end if</i> <i>end loop</i> <i>display name_of_winner</i> (1 mark) </p> <p><i>Note: There are 4 assignments for a total of 2 marks – 1 mark for any two assignments</i></p> <p><u>OR</u></p> <p> <i>max = 1</i> (1 mark) <i>for position = 1 to end of list do</i> (1 mark for loop with termination) <i>if height[position]> height[max] then</i> (1 mark for IF and termination, 1 mark for correct condition) <i>max = position</i> (1 mark) <i>end if</i> <i>end loop</i> <i>display name[max]</i> (1 mark) </p> <p><i>Note: Other correct expressions are possible. Exam paper shows four entrants so accept loop four times</i></p>	6 PS
	(c)	<p>(i)</p> <ul style="list-style-type: none"> • <i>Change initial condition to smallest = height[1]</i> • <i>Change > to < OR 'change greater than to less than'</i> • <i>Change variable names to eg tallest to smallest / max to min (as appropriate to candidate answer in (b))</i> • <i>Change output line</i> <p>(1 mark for 1 point as shown)</p>	1 PS
		<p>(ii)</p> <ul style="list-style-type: none"> • <i>Change initial condition to smallest = height[1] which can be reset when a lower value is found</i> • <i>Change > to < since looking for smaller values than the current one</i> • <i>Change variable names to eg tallest to smallest/max to min to reflect meaningful variable names</i> • <i>Change output line to reflect change in variable name/new context if name is in descriptive text</i> • <i>Accept responses referring to the fact that "find min", rather than "find max", is required as these are not named in the question</i> <p>(1 mark for one explanation)</p>	1 PS

22.	(a)	The first IF is true, but the second and third IFs will still be evaluated (1 mark) wasting processor time (1 mark)	2 PS
	(b)	<p><u>Nested IF</u> IF cost per person is less than 500 set band to 'cheap' ELSE IF (cost per person less than 2000) set band to 'medium'; ELSE Set band to 'expensive'; (END IF)</p> <p>OR ... <u>CASE statement</u></p> <p>CASE cost per person OF IS < 500 : set band to 'cheap'; IS < 2000 : set band to 'medium'; Otherwise Set band to 'expensive' (END CASE)</p> <p>(1 mark for concept of nested IF or CASE; 1 mark for all conditions/assignments correct within nested IF or CASE) Note: Other valid responses are possible. Accept other syntax in pseudocode. Second mark is contingent on the first</p>	2 PS
	(c)	By value (1 mark) since the value is not being changed in the procedure (1 mark). Note "double jeopardy"	2 PS
	(d)	Concatenation : Joining/adding together of (sub-)strings (1 mark)	1 KU
	(e)	A (self-contained/discrete/named) module/unit/block/section of code (1 mark) which has a value/returns a single value to the calling program (1 mark)	2 KU

SECTION III Part A: Artificial Intelligence

23.	(a)	<i>Test a system/device/program for presence of (artificial) intelligence (or similar) (1 mark)</i>	1 KU
	(b)	<ul style="list-style-type: none"> • <i>Identifies keywords/phrases from human sentence</i> • <i>Matches an appropriate response (from bank)</i> • <i>If there isn't a match, makes a generic response or another start point</i> <i>(Any two - 1 mark each)</i>	2 KU
	(c)	<ul style="list-style-type: none"> • <i>May fail to store a previous responses</i> • <i>Inability to include current or topical statements</i> • <i>Inability to problem solve in conversation</i> • <i>Inability to comprehend humour/emotion</i> • <i>vocabulary/grammar may be artificial/unusual</i> • <i>Any other reasonable</i> <i>(Any two - 1 mark each)</i>	2 PS
	(d)	<p><i>Any one of increased clock speed/presence of cache/increased cache/multiple processors (1 mark)</i></p> <p><i>Any valid description of how performance is improved (1 mark) ie</i></p> <ul style="list-style-type: none"> • <i>Multiple threads/queries improving searching/pattern matching</i> • <i>Faster execution producing faster responses</i> 	1 KU, 1 PS

24.	(a)	<i>Problem solving (1 mark)</i>	1 PS
	(b)	<i>The computer is merely following instructions of the (intelligent) programmer/human. (1 mark)</i>	1 PS
	(c)	<i>Search tree (1 mark)</i>	1 KU
	(d)	<p><i>Breadth-first (1) because</i></p> <ul style="list-style-type: none"> • <i>All possible descendants from the start state have been generated</i> • <i>Node(0,5) would not be generated yet in depth-first</i> • <i>Node(3,5) would have been discarded in depth-first</i> • <i>Each node in a level is checked before proceeding to the level below</i> <p><i>Any of the bullet points award 1 mark</i></p>	2 PS
	(e)	<ul style="list-style-type: none"> • <i>Depth-first (1 mark) and Heuristic (1 mark)</i> <p><i>Note: Other valid AH answers may appear, such as A*, best-first, hill-climbing</i></p> <p><i>Note: Avoid double jeopardy with answer in part (d)</i></p>	2 KU
	(f)	<i>(0,3) (1 mark)</i>	1 PS
	(g)	<ul style="list-style-type: none"> • <i>Empty 3 litre jug</i> • <i>Empty 5 litre jug</i> • <i>Fill the 3 litre jug from the 5 litre jug/Pour the 5 litre jug into the 3 litre jug</i> <p><i>(1 mark for each of two valid moves)</i></p>	2 PS

25.	(a)	<ul style="list-style-type: none"> • Flat/ two-dimensional viewpoint, eliminating/reducing problems with 3D depth perception • Light variation/shadows have been reduced/eliminated by the use of a lamp • Edge detection of rectangular objects with straight lines is simpler. • Tiles on known background colour/conveyor belt <p>(1 mark for each of two valid points)</p>	2 PS
	(b)	<p>32 bit colour = 4294967296 (accept 2^{32}) colours (1 mark) Note: Not "4 billion colours"</p>	1 PS
	(c)	<ul style="list-style-type: none"> • Signal processing (1 mark) convert signal into form that can be understood/digitisation/"clean up" signal (1 mark) • Edge detection (1 mark) identify sharp changes in colour/tone/light as edges, making a wireframe model (1 mark) • Object recognition (1 mark) wireframe model is matched against templates of known objects (1 mark) • Image understanding (1 mark) analysis of collection of objects give sense of whole image (1 mark) 	4 KU
	(d)	<ul style="list-style-type: none"> • Weights will be initially set • Known inputs will be used and outputs compared to expected • Weights altered/rebalanced to achieve the known output • process repeated until all inputs and outputs match <p>(1 mark for each of three valid bullet points)</p>	3 PS
	(e)	<ul style="list-style-type: none"> • Vision system for lane control in a car. • Vision system used to inform sat nav • Any other valid vision system <u>embedded</u> in a larger system <p>(1 mark for any valid)</p>	1 KU

26.	(a)	<ul style="list-style-type: none"> • <i>Machines/computers/programs capable of doing task that would require intelligence if done by human</i> • <i>Ability of system to display/emulate intelligent human behaviour</i> • <i>Any other valid</i> <p><i>(1 mark for valid bullet)</i></p>	1 KU
	(b)	<ul style="list-style-type: none"> • <i>Ability to make decisions independent of external control</i> • <i>The ability to learn/problem solve/etc</i> <p><i>(1 mark for one of these or any other reasonable response)</i></p>	1 KU
	(c)	<ul style="list-style-type: none"> • <i>Power supply - battery needs recharging, attaching power cable hinders mobility</i> • <i>Vision system - detecting and avoiding obstacles/stairs</i> • <i>Navigation - planning a path or limiting the path using virtual walls across doorways</i> • <i>Type of terrain - choosing tools for cleaning different surfaces</i> <p><i>(Any two valid points, 1 mark each)</i> <i>Note: the points could come from the same bullet</i></p>	2 KU
	(d)	(i) <i>Where responsibility lies in the event of an accident (or other valid) (1 mark)</i>	1 PS
		(ii) <ul style="list-style-type: none"> • <i>Use a disclaimer (denying responsibility for accidents caused by not following instructions.)</i> • <i>Any method of avoiding accidents such as audible signals etc</i> • <i>Any other valid</i> <p><i>(1 mark for any valid point)</i></p>	1 PS

27.	(a)	$X = \text{druid}$ (1 mark)	1 PS
	(b)	? $\text{is_weapon_against}(X \text{ troll})$ (1 mark for predicate (is_weapon_against), 1 mark for two arguments in correct order ($X \text{ troll}$))	2 PS
	(c)	<ul style="list-style-type: none"> $\text{life_points}(\text{troll}, 800)$ would be false/no. $\text{not}(\text{life_points}(\text{troll}, 800))$ would be true (1 mark for each bullet point) Note: award a <u>single</u> mark for generic “evaluate $\text{life_points}(\text{troll}, 800)$ and then negate it/apply NOT”	2 PS
	(d)	<ul style="list-style-type: none"> Match at 13 X instantiated to troll, <u>subgoal has found(troll Z)</u> Match at 1 Z instantiated to jewel, <u>subgoal is weapon against(jewel Y)</u> Match at 8, $Y = \text{troll}$, new <u>subgoal troll=troll is true</u> <u>$\text{not}(\text{troll} = \text{troll})$ is false, subgoal fails</u> Backtrack to match at 2, Z instantiated to sword, new subgoal <u>is weapon against(sword, Y)</u> Match at 7, $Y = \text{orc}$ <u>$\text{not}(\text{troll} = \text{orc})$ succeeds</u> (Note: award mark for use of negation if not awarded at step 3/4 previously) Output $Y = \text{orc}$ (1 mark for each bullet point (max 7) plus one for correct use of the term backtrack (step 5))	8 PS
	(e)	(i) $\text{stronger_than}(X Y)$ (1 mark for predicate (stronger_than), 1 mark for two arguments in correct order ($X Y$))	2 PS
		(ii) Corrective (1 mark)	1 PS

SECTION III Part B: Computer Networking

28.	(a)	(i)	<i>Network (1mark)</i>	1 PS
		(ii)	<i>Presentation (1 mark)</i>	1 PS
	(b)		<ul style="list-style-type: none"> <i>IP adds its own header/address header/source/destination/IP header to each packet.</i> <i>IP routes the packets around the network.</i> <p>(1 mark for each bullet)</p>	2 KU
	(c)		<ul style="list-style-type: none"> <i>It reduces the number of collisions on a network (1 mark) therefore reducing the amount of data that would have to be re-transmitted (1 mark)</i> <i>It reduces simultaneous transmissions (1 mark) therefore reducing collisions (1 mark)</i> <p>(1 mark for each part of one bullet) Note: answers <u>must</u> refer to improving performance</p>	2 PS
	(d)		<p><i>Odd Parity</i></p> <ul style="list-style-type: none"> <i>there is an odd number of ones/zeros</i> <i>five ones to be transmitted</i> <i>there was an even number of ones before the parity bit was added</i> <p>(1 mark for Odd Parity and one mark for any one bullet)</p>	2 PS
	(e)		<p><i>Asynchronous (1 mark)</i></p> <ul style="list-style-type: none"> <i>Asynchronous uses start and stop bits around each byte/character/word</i> <i>Synchronous uses a start and stop frame for each packet of data. It does not use a start/stop bit.</i> <p>(1 mark for a valid bullet)</p>	2 KU

29.	(a)	<ul style="list-style-type: none"> • Security - computers must be physically connected to access the network/<u>harder</u> to intercept data • <u>Less</u> interference/signal drop-off • Bandwidth - Faster transmission speeds <p>(1 mark for any one bullet)</p>	1 PS
	(b)	Passive Attack (1 mark)	1 PS
	(c)	<p><title> White Tooth </title> (1 mark for opening and closing of title tag) (1 mark for White Tooth (Note: Do not accept The White Tooth Dental Company))</p>	2 PS
	(d)	<p>An image can contain:</p> <ul style="list-style-type: none"> • 16,777,216 colours • 16.7 million colour • 2^{24} colours • 24 bit colour <p>(Any 1 bullet – 1 mark)</p>	1 KU
	(e)	(i) Metatag (with keywords) (1 mark)	1 PS
		(ii) Header/head (1 mark)	1 KU
	(f)	(i) Wireless Markup Language/WML (1 mark)	1 KU
		(ii) WAP (1 mark)	1 KU
		(iii) State one other type of device that uses this protocol.	1 PS
		<p>PDA/palmtop/Pager/2-way Radio/Any other valid (1 mark) Note: not branded devices (ie iPod)</p>	
	(g)	Corrective (1 mark)	1 KU

30.	(a)	Telnet (1 mark)	1 KU
	(b)	<p>(i)</p> <ul style="list-style-type: none"> • Bandwidth consumption - This degrades the server performance by sending a large number of data packets in a short period of time. • Resource starvation - An attack which is intended to use resources that would bring the network down. For example, an e-mail inbox could be bombarded with e-mails and so would fill up and therefore not allow genuine e-mails through. • Programming flaws - This takes advantage of bugs in networking software. • Attacking the routers - This involves “hi-jacking” data packets and routing them to the target server, which then gets flooded with data packets, or re-directing them to false addresses. • Domain Name Server attacks/IP Spoofing - This involves sending a large number of DNS queries with a spoofed IP address of the target server. The DNS then floods the target server with an excessive amount of replies. <p>(1 mark for name and 1 mark for corresponding description)</p>	2 KU
		<p>(ii)</p> <ul style="list-style-type: none"> • Cost of determining the nature of the attack • Cost of repair and response to the attack • Cost of devising and implementing safeguards • Cost of additional admin to compensate for loss of network services <p>Any other valid cost (1 mark each for any two bullets – max 2) Note: Simplistic answers like “costs a lot” award 0 marks</p>	2 PS
	(c)	<ul style="list-style-type: none"> • Monitors all communication ports/checks packets/block ports • Keeps track of all communications/makes user log • Blocks unauthorised access/prevents unsolicited traffic • IP Filtering <p>(1 mark for each bullet – max 2)</p>	2 PS
	(d)	<ul style="list-style-type: none"> • Authenticate the user (1 mark) - a “callback” facility to correct phone line/IP address (1 mark) • Set user permissions (1 mark) allocating the minimum necessary access to each user/levels of access (1 mark) • Encrypting data (1 mark) to make data unreadable/give each employee a restricted key (1 mark) • Use a secure protocol such as HTTPS (1 mark) to make data unreadable in transit (1 mark) • Other valid method (1 mark) showing how it prevents access (1 mark) <p>(1 mark for each part of any two bullets – max 4) Note: walled gardens prevent access from user to outside, <u>not</u> hackers Note: usernames and passwords are already used (see stem)</p>	4 PS

	<p>(e)</p> <ul style="list-style-type: none"> • <i>It creates a backup</i> • <i>Which allows data to be saved to several disks at the same time</i> • <i>Creates an exact /up-to-date copy of the data on the server</i> <p><i>(Any 2 bullets – 1 mark each – max 2)</i></p>	2 PS
	<p>(f) The school is concerned about staff and pupils accessing websites from school computers.</p>	
	<p>(i) Explain how a <i>walled garden</i> would prevent staff and pupils from accessing unsuitable websites.</p>	2 PS
	<ul style="list-style-type: none"> • <i>List of approved website/URLs (in the software)</i> • <i>Only approved websites can be viewed/all others are blocked</i> <p><i>(1 mark for each bullet – max 2)</i></p>	
	<p>(ii) Describe one way that <i>Internet filtering</i> software differs from a <i>walled garden</i>.</p>	1 KU
	<ul style="list-style-type: none"> • <i>Unsuitable websites/URLs are listed in the Internet Filtering software</i> • <i>Websites containing certain keywords/content/file types/domain names can be blocked</i> <p><i>(1 mark for any one bullet)</i></p>	
	<p>(g) The teacher creates a <i>WPAN</i> to connect her laptop, printer and smartphone. Explain one reason why a <i>WPAN</i> would be appropriate for this network.</p>	1 PS
	<ul style="list-style-type: none"> • <i>Uses wireless transmission/no cables</i> • <i>Across a very short range</i> • <i>Low power consumption</i> • <i>Other valid</i> <p><i>(1 mark for any one valid)</i></p>	

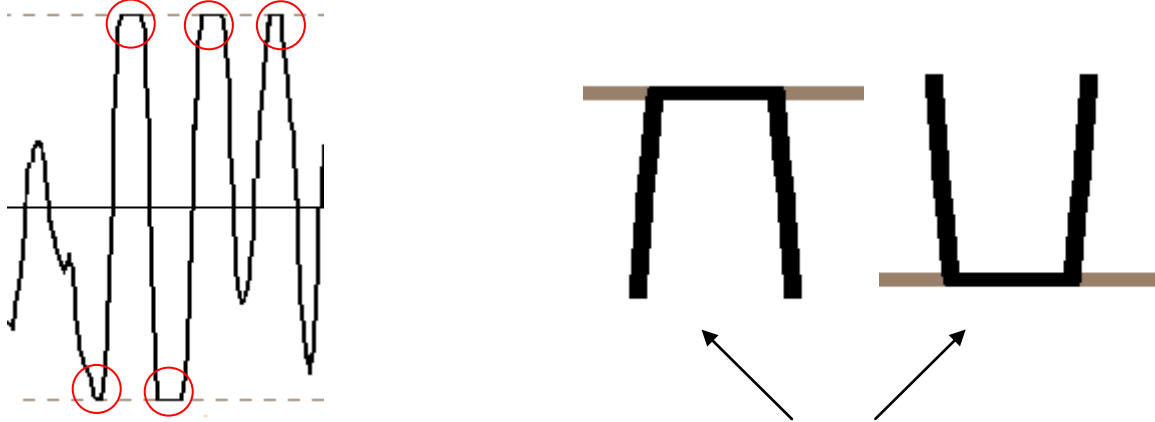
31.	(a)	<ul style="list-style-type: none"> • Class A allows 16,777,214 addresses ($2^{24} - 2$) (Accept 2^{24}) • A small network would use class C (with 254 addresses) • Only 12 IP addresses are needed <p>(1 mark for any one bullet)</p>	1 PS
	(b)	<ul style="list-style-type: none"> • (Uniquely) identifies a computer/device (on a network). (1 mark) <p>Note: question asks for purpose of MAC rather than definition</p>	1 KU
	(c)	<ul style="list-style-type: none"> • The original/same calculation is carried out • A comparison is made to the original • If there is a difference, there has been an error/data will need to be retransmitted • If the results match the data will be accepted <p>(1 mark for each of three bullets – max 3)</p>	3 KU
	(d)	(i) <ul style="list-style-type: none"> • (Splits the data into small parts and) each packet may take a different route to its destination • Unlikely to intercept all packets/the whole file <p>(1 mark for each bullet)</p>	2 PS
		(ii) Circuit switching (1 mark)	1 PS
	(e)	(i) <ul style="list-style-type: none"> • $(150 * 8) = 1,200$ Megabits • $1,200 / 8 = 150$ seconds ($/ 60 = 2.5$ minutes) <p>OR</p> <ul style="list-style-type: none"> • 8 megabits per second = 1 megabyte per second • 150 megabytes takes 150 seconds ($/ 60 = 2.5$ minutes) <p>(1 mark for each bullet – max 2)</p> <p>Note: avoid double penalising initial error, by using their number in the rest of the question</p>	2 PS
		(ii) <ul style="list-style-type: none"> • Bad packets needing re-sent/collisions of data • Rest of message frame (parity etc) takes up space and hence bandwidth • Another part of the network may have a slower connection • Sharing bandwidth with other users/processes • Integrity checks on file • Any other valid <p>(1 mark for each of two valid bullets – max 2)</p>	2 PS

SECTION III Part C: Multimedia Technology

32.	(a)	<p>(i)</p> <ul style="list-style-type: none"> • Can be replayed on any musical instrument with a MIDI interface (eg keyboard, synthesiser, drum machine) • Accuracy of playback sound not necessary for practise • individual instruments/notes can be edited or have effects added • Backing tracks unlikely to include voice • No interference/white noise/background sounds <p>(1 mark each for any 2 of the above)</p>	2 KU
		<p>(ii)</p> <p>Duration – length (number of beats) of a <u>note</u> (1 mark) Tempo – speed at which music is to be replayed/number of beats per minute (bpm) (1 mark)</p> <p>NB : duration must refer to a note not the track</p>	2 KU
	(b)	<ul style="list-style-type: none"> • MP3 can be played on a wider variety of players than MIDI (1 mark) • MP3 produces a more natural sound • MIDI sound can vary as same “instrument” may differ between devices <p>(1 mark each for any 2 of the above or other valid) Notes: scenario precludes voices. Compression using MP3 will not generally yield a smaller file</p>	2 PS
	(c)	<p>No. of frames = $64 \times 25 = 1600$ No. of pixels = $1024 \times 768 = 786432$</p> <p>File size = No. of frames x No of pixels x bit depth = <u>$1600 \times 786432 \times 24$</u> bits (1 mark for <u>each</u> underlined section) = 30198988800 bits = 3774873600 bytes = 3686400 Kb = 3600 Mb (1 mark)</p> <p>Note : all 3 marks to be awarded for <u>correct</u> answer with no explanation</p>	3 PS
	(d)	<p>No permanent copy on pupil computer (1 mark)</p>	1 PS
	(e)	<ul style="list-style-type: none"> • If data buffered is viewed before next block is stored/received • Then video is paused until next block is stored/received <p>(1 mark for each of the above)</p>	2 PS

33.	(a)	<ul style="list-style-type: none"> • Faster data transfer rate (up to 4.8 Gbits per sec) • USB interface more common on current computer hardware • USB3.0 has backward compatibility with previous USB interfaces <p>(1 mark for any 2 of the above or other valid response)</p>	2 PS
	(b)	<ul style="list-style-type: none"> • Wireless connectivity already available (even if limited) • WiFi reduces battery life • Extra weight/ larger device <p>(1 mark for any of the above or other valid response)</p>	1 PS
	(c)	No moving parts/motor (1 mark) so less power is required (1 mark)	2 PS
	(d)	<p>Advantage : faster compression/processing rate (1 mark)</p> <p>Disadvantage : Cannot be (easily) upgraded (1 mark)</p>	2 PS
	(e)	(i) Allows an effect to be used when clips are joined together (1 mark)	1 KU
		(ii) <ul style="list-style-type: none"> • Wipe – line moves across first clip replacing it with next clip • Fade out/in – clip gradually dwindles to black/emerges from black • Dissolve – first clip gradually morphs into next clip • Hard cut – first clip changes instantly to next clip • Page turn – first clip peels away from screen to show next clip • Other valid answer – with description <p>(1 mark for effect, 1 mark for suitable description)</p>	2 KU
	(f)	<p>EasyVid3 and EasyVid4 data is already captured/stored in digital. (1 mark)</p> <p>Note: Trivial answers such as “they are digital cameras” are not acceptable</p> <p>Responses must make reference to capture/conversion/storage by the camera</p>	1 PS

34.	(a)	<ul style="list-style-type: none"> • Shows timing/transitions between screens • Gives content of screens eg placement of items/layout, actual content, backgrounds, colour schemes • Gives navigation links/hyperlinks <p>(1 mark each for any 2 of the above or other valid reason)</p>	2 KU
	(b)	<p>File size = 11000 x 24 x 8 (1 mark) x 2 (1 mark) bits = 4224000 bits = 528000 bytes = 515.625 Kb = 515.6 Kb (1 mark)</p> <p>Note : all 3 marks to be awarded for correct answer with no explanation</p>	3 PS
	(c)	(i) ADPCM (Adaptive Delta Pulse Code Modulation/Adaptive Differential Pulse Code Modulation) (1 mark)	1 KU
		(ii) <ul style="list-style-type: none"> • Stores a sampled sound then change between sound samples (not the actual samples) • Compression is because number of bits required to store change between samples is less than sample amplitude value. <p>(1 mark for each) Note: double jeopardy applies here</p>	2 KU
	(d)	<p>Storing recordings in mono would half storage required (1 mark) Edit out pauses et cetera to shorten the clip (1 mark)</p>	1 PS
	(e)	Fade in (1 mark)	1 PS

	(f)	(i)	 <p>Minimum acceptable diagrams</p>	2 KU
			<p>Graph must show flat (clipped) section(s) (1 mark) Clipping occurs when sound outwith the dynamic range is lost (1 mark)</p>	
		(ii)	<p>It calculates average volume/level (1 mark) Scales amplitudes/volumes to bring everything within dynamic range (1 mark)</p>	2 PS
		(iii)	<p>Every sound in the file is affected (1 mark) Therefore background noise will also be boosted (1 mark)</p>	2 PS

35.	(a)	<ul style="list-style-type: none"> • Vector graphic formats store each object (and its attributes) separately • Adding another object requires more data to be stored (so file size increases) <p>(1 mark for each point)</p>	2 PS
	(b)	<ul style="list-style-type: none"> • Vector graphic formats are displayed at hardware's resolution/resolution independent • So scaling will not affect image quality in vector • Bitmaps become pixelated if graphic is scaled up <p>(1 mark for each of two valid points)</p>	2 PS
	(c)	<p>It will be a lighter/paler (1 mark) shade of green (1 mark)</p> <p>Less detailed answers, such as "it will be less green", gain 1 mark</p>	2 PS
	(d)	<p>(i)</p> <ul style="list-style-type: none"> • Dithering uses patterns of existing colours to create illusion of additional colours (not in palette/at bit depth) • Two (or more) adjacent coloured pixels create the illusion of another colour (not in the palette) <p>(1 mark for any valid)</p>	1 KU
		<p>(ii)</p> <p>PNG allows 2^{24} (16 million) colours (1 mark)</p> <p>More colours are not required/this is true colour (1 mark)</p>	2 PS
	(e)	<p>(i)</p> <p>To smooth jagged edges of curves/diagonals (1 mark)</p>	1 KU
		<p>(ii)</p> <ul style="list-style-type: none"> • Image scanned/drawn/displayed at low resolution • Improve the look of a (low resolution/pixelated) image • Description of other valid situation <p>(1 mark for any one of the above)</p>	1 PS

[END OF MARKING INSTRUCTIONS]