



2007 Computing

Higher

Finalised Marking Instructions

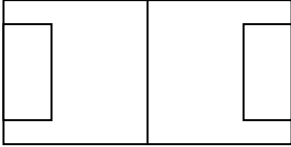
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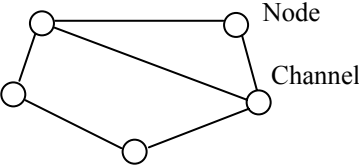
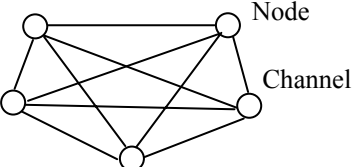
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SECTION I

1	<p>Two versions of the image below have been created. One in a <i>bit-mapped</i> graphic package and the other in a <i>vector</i> graphic package.</p>  <p>If a circle is added to the centre of the graphic, what is the effect on the file size in each case?</p>	2PS
	<ul style="list-style-type: none">• <i>Bit-mapped graphic – no change</i>• <i>Vector graphic – increase in the file size</i> <p><i>1 mark for each</i></p>	

2	<i>ASCII</i> and <i>UNICODE</i> are both used to represent text in computer systems.		
	(a)	Describe one advantage of <i>UNICODE</i> over <i>ASCII</i> .	1KU
		<ul style="list-style-type: none"> • <i>Has a greater range of possible characters</i> <p><i>OR</i></p> <ul style="list-style-type: none"> • <i>The alphabets of more languages are supported</i> <p>1 mark for either above Not “has more bits” as this is not an advantage</p>	
	(b)	Describe one disadvantage of <i>UNICODE</i> over <i>ASCII</i> .	1KU
		<ul style="list-style-type: none"> • <i>More bits are used to represent each character (or similar) means more memory/backing storage used</i> <p>1 mark for the above Not “has/needs more storage”</p>	
3	What is the 8 bit two’s complement representation of the number -72 ?		1PS
	<i>10111000</i>		
4	Explain why increasing the width of the <i>data bus</i> improves <i>system performance</i> .		1KU
	<ul style="list-style-type: none"> • <i>More data can be fetched from memory during <u>each fetch cycle/at one time</u></i> <p><i>OR</i></p> <ul style="list-style-type: none"> • <i>Less fetches from memory required</i> <p>1 mark for either above</p>		

5	The <i>read</i> and <i>write lines</i> are two <i>control lines</i> . Name two other control lines.	2KU
	<ul style="list-style-type: none"> • <i>Reset</i> • <i>Clock</i> • <i>Non-maskable interrupt</i> • <i>Interrupt</i> <p><i>Any two from the above, 1 mark each, total 2 marks</i></p>	
6.	Describe how a printer <i>spooler</i> operates.	2KU
	<p><i>The print jobs are:</i></p> <ul style="list-style-type: none"> • <i>stored (temporarily) on a fast backing store</i> • <i>stored in a queue/sent to the printer as it becomes available.</i> <p>1 mark for each of the above <i>Note: Not just “frees up processor”</i></p>	
7	When a program is loaded from a hard disk drive into <i>RAM</i> which function of the <i>operating system</i> is responsible for ensuring that there is enough RAM available to load the file?	1KU
	<i>Memory Management</i>	

8	(a)	Draw and label a diagram of a <i>mesh</i> network with five nodes.	1PS
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;"> <p>OR as a fully connected mesh</p> </div> <div style="text-align: center;">  </div> </div> <p><i>Suitably annotated diagram with multiple connections between the nodes (accept if 4 or more nodes are drawn). Must have at least two labels, eg node and channel, for 1 mark.</i></p>	
	(b)	Explain how the topology of a mesh network includes protection against the consequences of channel failure.	1KU
		<ul style="list-style-type: none"> • <i>In the event of a channel failure the data will be sent via a different path.</i> • <i>If one channel fails at a node then another will be used to transfer data.</i> <p><i>1 mark for any one of the above</i></p>	
9		When a computer is switched on part of the operating system (OS) is already in memory.	
	(a)	What is the name given to the part of the OS that locates and loads the rest of the OS into memory?	1KU
		<i>Bootstrap loader</i>	
	(b)	State the type of virus that can affect the computer during the loading of the operating system.	1KU
		<i>Boot sector virus</i>	
10		Software can be evaluated in terms of its <i>portability</i> . Describe what is meant by “portability”.	2KU
		<i>Program will run <u>with little/no alteration</u> (1 mark) on a computer system <u>other than the one it was designed for</u> (1 mark).</i>	

11	A software development company prefers to employ an <i>independent test group</i> during the test stage.		
	(a)	Describe what is meant by an “independent test group”.	1KU
		<p><i>Their testing is independent since:</i></p> <ul style="list-style-type: none"> • <i>they are not the actual programmers of the code</i> • <i>they are not part of the client company or software development company.</i> <p>1 mark for either answer</p>	
	(b)	Explain why the software development company prefers to use such a group.	1PS
		<ul style="list-style-type: none"> • <i>Test the program more objectively/without bias.</i> • <i>More likely to apply range of test cases.</i> • <i>Programmers are more likely to miss errors that they created.</i> • <i>ITG will not sign off the project just to make a deadline.</i> • <i>Programmers likely to apply data that the program expects.</i> <p>1 mark for any valid point <i>Note: Not just “so software is fully tested”</i></p>	
12	<i>Maintainability</i> is an important characteristic of software. State two characteristics of program code that improve maintainability.		2KU
		<ul style="list-style-type: none"> • <i>Modularity</i> • <i>Internal commentary</i> • <i>White space/indentation</i> • <i>Meaningful identifiers</i> <p>1 mark each for any two</p>	

13	One type of high level language is a <i>declarative language</i> . State two features of a declarative language.	2KU
	<ul style="list-style-type: none"> • <i>Consists of facts and rules</i> • <i>Which can be searched/queried</i> • <i>Uses pattern matching</i> • <i>Uses recursion/inheritance</i> • <i>Any other valid</i> <p><i>1 mark each for any two answers specific to <u>declarative languages</u></i></p>	
14	Programmers make use of different types of variables including <i>Boolean</i> .	
(a)	Describe what is meant by a “Boolean” variable.	1KU
	<i>Holds only true or false, accept any answer that indicates that there are only two possible values.</i>	
(b)	Describe, using <i>pseudocode</i> , how a Boolean variable would be used.	1PS
	<p><i>In pseudocode: if item() = target then found = true</i> OR <i>As description: variable could be set to false until the item is found when it could be changed to true.</i></p>	
15	A <i>macro</i> extends the functionality of a general-purpose package. State two methods of creating a macro.	2KU
	<ul style="list-style-type: none"> • <i>Record a series of keypresses, menu choices and mouse clicks.</i> • <i>Using a scripting language.</i> <p><i>1 mark for each valid point</i></p>	

16	<p>The string variable forename contains “Kathryn” and the variable surname contains “Barr”. The variable username is assigned the value “KatBar” using the first three characters of each name.</p> <div style="display: flex; justify-content: space-around; align-items: center; margin: 20px 0;"> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">forename</div> <div style="border: 1px solid black; padding: 5px; width: 80px; margin: 5px auto;">Kathryn</div> </div> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">surname</div> <div style="border: 1px solid black; padding: 5px; width: 80px; margin: 5px auto;">Barr</div> </div> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">username</div> <div style="border: 1px solid black; padding: 5px; width: 80px; margin: 5px auto;">KatBar</div> </div> </div> <p>Use a language of your choice to show how substrings and concatenation would be used to assign the value “KatBar” to the variable username.</p>	3PS
	<p><i>username=forename(1, 3) + surname(1, 3)</i></p> <p>1 mark for assignment 1 mark for concatenation, symbol (++,+ or &) 1 mark for both substrings in correct order</p> <p><i>The answer in Java would be username:=forename.substring(0,2)+surname.substring(0,2)</i> <i>The answer in Visual Basic would be LET username = mid(forename, 1,3)& mid(surname, 1,3) [OR left(forename,3)&left(surname,3)]</i> <i>The answer in True Basic would be LET username\$ = forename\$[1:3]&surname\$[1:3]</i> <i>Note: Allow some leeway in syntax</i></p>	

SECTION II

17	John uses his digital camera to take photographs. It has a 512 Megabyte memory card. His camera uses 16,777,216 colours and is set to a resolution of 3000 x 2000 pixels.		
	(a)	(i) Calculate the file size of a single image. Your answer should be in appropriate units. Show all working.	3PS
		<p><i>Size of 1 image is</i> $= 3000 \times 2000$ (1 mark) $\times 24$ bits (1 mark for multiplication by 24) $= 144,000,000$ bits $= 18,000,000$ bytes $= 17.2$ Mb (1 mark for correct conversion to Mb)</p> <p>3 marks if 17.2 Mb given without working as correct method must be assumed.</p>	
		(ii) What is the maximum number of images of this size that can be stored on John's memory card?	2PS
		<p><i>No of images is $512/17.2 = 29.77$ so 29 images can be stored</i></p> <p>1 mark for calculation and 1 mark for rounding down</p> <p><i>NOTE – If part (i) answer is wrong but used correctly in (ii) allocate the marks.</i></p>	
	(b)	State two reasons why digital images are stored as <i>JPEGs</i> .	2PS
		<ul style="list-style-type: none"> • <i>JPEG files are compressed (to reduce file size)</i> • <i>JPEG is a common file format (used by many applications).</i> • <i>JPEG supports millions of colours/has large bit depth/24 bit (more realistic image).</i> <p><i>Any two of the above or other suitable 1 mark each.</i></p>	

	<p>(c) He changes the setting in his camera to reduce the <i>bit-depth</i>. Describe one effect that this will have.</p>	1PS
	<ul style="list-style-type: none"> • <i>He will be able to store more images.</i> • <i>The file size of each image will be reduced.</i> • <i>The number of available colours (per pixel) is reduced.</i> <p><i>Any one of the above or other suitable 1 mark</i></p>	
	<p>(d) He connects his camera to his computer. One function of the interface is the handling of <i>status signals</i>. Describe what is meant by the term “status signals”.</p>	2KU
	<ul style="list-style-type: none"> • <i>Status signals are messages passed between the CPU and peripherals.</i> • <i>Confirming whether the peripheral device (camera) is ready to send/receive data.</i> • <i>Confirm that the signal/data has been received.</i> <p><i>1 mark for each of two valid bullets</i></p>	
	<p>(e) There are a large number of pictures on his hard disk. The combined size of all of his photographs is 3 Gb.</p> <p>He can use a <i>solid-state storage device</i> or Rewritable DVD to take all of his photographs to his chemist shop for printing. Recommend one of these devices and justify your choice.</p>	1PS
	<p><i>Solid-state device</i></p> <ul style="list-style-type: none"> • <i>More physically robust than DVD</i> • <i>Any other suitable</i> <p><i>DVD-RW</i></p> <ul style="list-style-type: none"> • <i>DV-RW media are inexpensive</i> • <i>Any other suitable</i> <p><i>1 mark for suitable justification. No credit for name only.</i></p>	

18	Crawford Construction Ltd has employed a <i>systems analyst</i> to investigate the possibility of networking all of the computers in the company.		
	(a)	Describe one technique the systems analyst could use at the analysis stage.	1KU
		<ul style="list-style-type: none"> • Interview the users/clients to establish needs. • Observe the current system in operation. • Examine the data/information to be passed around the network. <p>Any one description from the above 1 mark.</p>	
	(b)	The systems analyst recommends a <i>client-server</i> network. State two benefits of a client-server in terms of network management.	2KU
		<ul style="list-style-type: none"> • Centralised backup of files. • Increased security of access to data. • Can easily allocate different levels of access to data. • Updating software can be done remotely. • Sharing of resources can be managed more easily ie data/printers. • Reports on station usage can be generated and stored centrally. • Reports on individual usage can be generated. <p>Any two from the above or other suitable.</p>	
	(c)	Describe two technical factors that have contributed to the growth of <i>local-area networks</i> (LANs).	2KU
		<ul style="list-style-type: none"> • A standard protocol for communication (TCP/IP). • NIC built into motherboards of most standard computers. • Software to enable networking already built into the Operating System. • Wireless technology/interfaces becoming more common. • Much easier to set up a network using wizards/help. • High bandwidth/connection speed • Any other valid <p>Any two from the above list 1 mark each. Treat as a “state” question.</p>	

	(d)	LANs may use a <i>hub</i> or a <i>switch</i> . Explain the difference between a hub and a switch.	2PS
		<ul style="list-style-type: none"> • <i>A hub makes a packet (data) available to all stations connected to it OR broadcast to all stations (1 mark)</i> • <i>Whereas a switch directs the packet (data) to a specific station OR a switch routes point to point (1 mark)</i> <p>2 marks</p>	
	(e)	The LAN is to be connected to the Internet.	
	(i)	State one benefit of installing a <i>web server</i> .	1KU
		<ul style="list-style-type: none"> • <i>Pages held locally allowing faster access to page/pages which are cached.</i> • <i>Can monitor web usage through the server.</i> • <i>Any other valid</i> <p><i>Any one from above 1 mark only.</i></p>	
	(ii)	Describe two possible problems which could arise from connecting the LAN to the Internet.	2PS
		<ul style="list-style-type: none"> • <i>Attack from hackers</i> • <i>Increased chance of a virus</i> • <i>Staff distracted from jobs by web surfing</i> • <i>Pop-up interfering with work</i> • <i>Adware, or other unwanted programs, may be installed across the LAN</i> <p><i>Any two from the above or other valid answer 1 mark for each.</i></p>	

19	Hazeltown Basketball Club would like to set up a computer system to manage their membership details. The Secretary already has a computer but does not have any suitable software.		
	(a)	Before purchasing the new software the Secretary must ensure that the software is compatible with his computer. Processor speed is one hardware factor which should be considered when making the purchase.	
		(i) Name one other hardware factor which should be considered.	1PS
		<ul style="list-style-type: none"> • <i>The amount of RAM in the computer.</i> • <i>The type of processor eg software may only run on a 64 bit machine.</i> • <i>The amount of free space available on his hard drive.</i> <p><i>Any one from the above 1 mark</i></p> <p><i>Note - watch out for compatibility of OS – no marks as this is not hardware.</i></p>	
		(ii) Name and describe one piece of documentation likely to be provided with the software.	2KU
		<p><i>User guide:</i></p> <ul style="list-style-type: none"> • <i>instructions on the operation of the software and installation</i> • <i>to teach the user how to operate the program</i> • <i>contains a tutorial guide to teach the user how to use the program.</i> <p><i>Technical guide:</i></p> <ul style="list-style-type: none"> • <i>instructions on the system requirements</i> • <i>instructions on how to install the software.</i> <p><i>Licence for the software:</i></p> <ul style="list-style-type: none"> • <i>to allow the legal use of the software.</i> <p><i>1 mark for the name and 1 mark for the description.</i></p>	

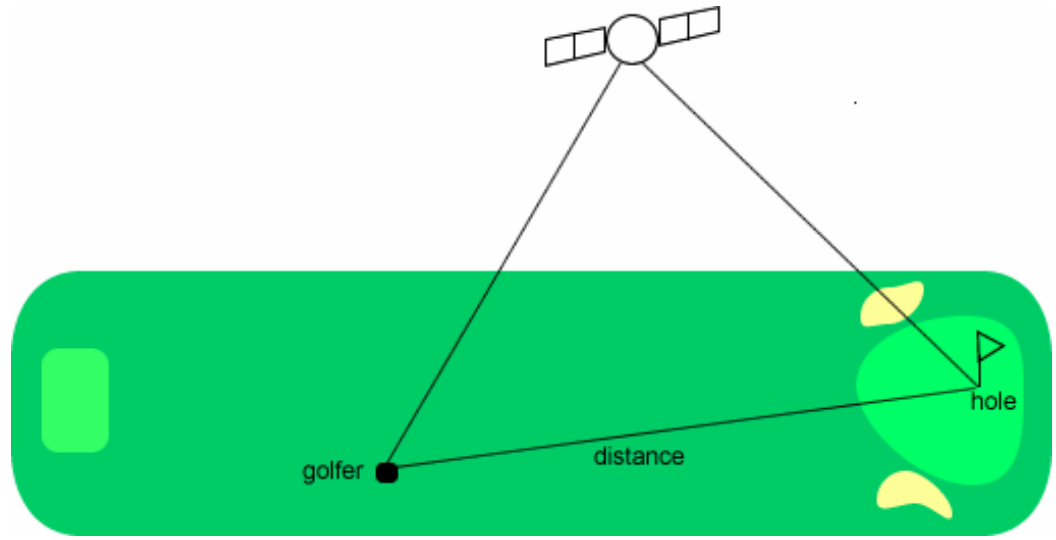
	(b)	<p>The secretary decides to buy a new computer. He has a choice of either the Mercury ZX or the Phantom IV.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Mercury ZX 3.7 GHz Ami Processor 1 Mb Cache memory 32 bit Data Bus 24 bit Address Bus 512 Mb RAM 400 Gb Hard Disk</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Phantom IV 3.9 GHz Storm Processor 2 Mb Cache memory 32 bit Data Bus 24 bit Address Bus 512 Mb RAM 320 Gb Hard Disk</p> </div> </div>	
	(i)	<p>Explain one technical reason why the Phantom IV may give the best performance.</p>	2PS
		<ul style="list-style-type: none"> • <i>Faster clock speed (1 mark) will mean more instructions fetched in a fixed time (1 mark).</i> <li style="padding-left: 20px;"><i>OR</i> • <i>Larger cache (1 mark) means (more instructions can be stored) <u>reducing fetches to main memory</u> (1 mark).</i> 	
	(ii)	<p>State one technical reason why the Mercury ZX may give the best performance.</p>	1PS
		<ul style="list-style-type: none"> • <i>Do not know the architecture of the machines/CPUs.</i> • <i>Mercury might have more efficient/effective instruction set.</i> • <i>Phantom IV may be CISC, Mercury may be RISC.</i> • <i>Mercury may have more registers within the CPU than the Phantom IV.</i> • <i>Mercury may process more instructions per second than the Phantom (may be expressed in terms of mips/flops).</i> • <i>Mercury may have a faster hard drive speed than the Phantom IV.</i> <p><i>Any one from the above or other valid reason 1 mark.</i></p>	

		(iii)	Calculate the maximum amount of memory which the Phantom IV computer can address. Give your answer in appropriate units. Show all working.	3PS
			<p>32×2^{24} bits OR $32 \times 16,777,216$ bits OR $1,073,741,824$ bits</p> <p>2 marks for any of the above includes 1 mark for 2^{24}</p> <p>= 4×2^{24} bytes OR $67,108,864$ bytes = 4×2^{14} Kb OR $65,536$ Kb = 4×2^4 Mb = 4×16 Mb = 64 Mb (1 mark for correct conversion)</p> <p>If 64 MB is given then all 3 marks must be allocated as working must be assumed as correct.</p>	

20	<p>Scientists are interested in studying the possible effects of global warming. Devices are placed at various locations to record temperatures. Each device takes one thousand temperature readings per day. Sample readings are shown below.</p> <p style="text-align: center;">Temperature</p> <p style="text-align: center;">2.04 1.62 0.04 1.42 2.56 3.52</p> <p>A program has been written to perform some analysis on the data collected.</p>		
	(a)	The temperature readings are stored in a 1-D array.	
	(i)	What is meant by a 1-D array?	2KU
		<p><i>List (1 mark)</i></p> <ul style="list-style-type: none"> • <i>of items/variable is accessed through its index.</i> • <i>of items of the same data type</i> <p><i>1 mark for any valid bullet point</i></p>	
	(ii)	Which data type is suitable for the array?	1PS
		<p><i>Real, single, float (do not accept number)</i></p> <p><i>Note: Integers are <u>not</u> suitable</i></p>	

	(b)	The program must find how many of the 1000 readings are above zero and less than ten degrees. Use <i>pseudocode</i> to write an algorithm which would determine the number of readings in this range.	5PS
		<i>set occurrences to 0</i> 1 mark <i>loop 1000 times (or for each item)</i> 1 mark loop with termination <i>if temp(.) > 0 and temp(.) < 10 then</i> 1 mark IF..AND..(THEN)..END IF, 1 mark for both conditions correct <i>increment occurrences</i> 1 mark <i>end if</i> <i>end loop</i>	
	(c)	The data is imported into a spreadsheet to perform additional analysis using a <i>scripting language</i> .	
	(i)	Describe two features of a scripting language.	2KU
		<ul style="list-style-type: none"> • <i>High level language embedded within a GPP/application/OS.</i> • <i>Allows you to simplify/customise the user interface.</i> • <i>Allows automating of frequently used commands.</i> 1 mark each for any two answers specific to <u>scripting</u> languages	
	(ii)	Describe two advantages of using a scripting language within the spreadsheet compared to developing all of the code using a high level programming language.	2PS
		<ul style="list-style-type: none"> • <i>Access to pre-written code of the package such as max, min, sort etc.</i> • <i>No need to create a user interface since a familiar one already exists.</i> 1 mark each	
	(iii)	Other than importing data suggest another use for a script.	1PS
		<ul style="list-style-type: none"> • <i>Creating a report from the data including charts.</i> • <i>Any other reasonable answer that combines features of package (accept complex sorting).</i> • <i>Creating and printing charts based on analysis.</i> 1 mark	

	(d)	Another device records air pressure as a 16 bit positive integer. Calculate the range of numbers that this device can store.	2PS
		<i>0 to 65 535 – 2 marks, one for each limit.</i> <i>Accept answers expressed as powers ie 0 to 2¹⁶-1</i>	

21	<p>A manufacturer of palmtop computers with a global positioning system wishes to offer its customers the facility to obtain distances when playing golf. It is helpful for golfers to know the distance from where they are to the hole. This helps the golfer play the next shot.</p>  <p>The diagram shows a green rounded rectangular palmtop computer. On the screen, a black dot is labeled 'golfer' and a green flag on a hole is labeled 'hole'. A line connects the golfer to the hole, with the word 'distance' written below it. Above the computer, a satellite is shown in orbit. Lines connect the satellite to both the golfer and the hole, forming a triangle that illustrates the GPS system's ability to measure distance.</p> <p>They appoint a software development company to create the software for this new system.</p>	
(a)	<p>The software company appoints a project manager. Describe two aspects of the role of the <i>project manager</i>.</p>	2KU
	<ul style="list-style-type: none"> • <i>Identify timescales/deadlines</i> • <i>Identify costs/resources</i> • <i>Provide technical guidance to client</i> • <i>Liaise with systems analyst, client</i> • <i>Any other suitable answer</i> <p><i>1 mark for each of two valid points</i></p>	

	(b)	(i)	Name and describe a document that the systems analyst will produce as a result of the analysis stage.	2KU
			<i>Software specification (1 mark)</i> <i>Formal/technical specification of the problem (with boundaries) OR forms a legal contract (1 mark)</i>	
		(ii)	Describe two ways in which this document could be used later in the software development process.	2PS
			<ul style="list-style-type: none"> • <i>Reference in any dispute at evaluation/maintenance stages</i> • <i>Guidance for design to inform that stage</i> • <i>Validate the design</i> • <i>Validate the software during evaluation stage</i> • <i>Testing reliability etc matches expectation</i> • <i>Any other valid</i> <p><i>1 mark for each of two valid points</i></p>	
	(c)		The software company uses <i>stepwise refinement</i> . Describe what happens during stepwise refinement.	2KU
			<i>Problem broken down into steps (1 mark) and these steps are further broken down until the subtasks are able to be coded (1 mark).</i>	
	(d)		The software company is keen that the software written should be <i>efficient</i> . Give two reasons why it is important that software written for a handheld computer should be efficient.	2PS
			<ul style="list-style-type: none"> • <i>Less powerful processor means code should not waste the processor's time.</i> • <i>Smaller amount of RAM means that space should not be used unnecessarily.</i> <p><i>1 mark for each valid reason. Other valid expressions of above are possible.</i></p>	

	(e)	The software is released to customers but the golfers complain that distances are very inaccurate.	
	(i)	Which type of maintenance is required? Give a reason for your answer.	2PS
		<i>Corrective (1 mark), since the program is producing the wrong results that were <u>not identified at testing</u>. 1 mark for reason.</i>	
	(ii)	Explain why documenting the testing stage of the software development process will aid maintenance.	1PS
		<i>If test reports are available then previously tested cases need not need to be retested. (1 mark)</i>	
	(f)	The software could be translated using a <i>compiler</i> or an <i>interpreter</i> . State two reasons why a compiler is a more suitable translator for this application.	2PS
		<ul style="list-style-type: none"> • <i>Palmtop has limited memory and a compiler does not require to be resident in memory (once program is compiled).</i> • <i>Less powerful processor in palmtop as interpreter would require processing time (for further translations).</i> • <i>Any other valid reason <u>tied to context</u></i> <p><i>1 mark for each of two valid points <u>tied to context</u></i></p>	

SECTION III – Part A – Artificial Intelligence

22	Mobile robots use <i>computer vision systems</i> when carrying components around a factory.		
	(a)	<i>Image acquisition</i> and <i>signal processing</i> are the first two of the five stages of computer vision. What are the last three stages?	3KU
		<ul style="list-style-type: none"> • <i>Edge detection (1 mark)</i> • <i>Object recognition (1 mark)</i> • <i>Image understanding (1 mark)</i> <p style="margin-left: 150px;">} <i>do not penalise if in wrong order</i></p>	
	(b)	State two difficulties that a vision system on a mobile robot may have in interpreting a new layout of machinery in a factory.	2PS
		<p><i>Recognition problems caused by:</i></p> <ul style="list-style-type: none"> • <i>seeing machines from a different angle</i> • <i>shadow on objects</i> • <i>obscured (parts of) objects</i> • <i>any other valid.</i> <p><i>Any two points for 1 mark each</i></p>	
	(c)	The factory has recently replaced dumb robots with intelligent robots. State two reasons why they may have done this.	2KU
		<ul style="list-style-type: none"> • <i>Moves to avoid obstacles</i> • <i>Works out most direct route/makes own decisions</i> • <i>Ability to learn</i> • <i>Ability to adapt to new situations/environment</i> • <i>Any other valid</i> <p><i>Any two points for 1 mark each</i></p>	

	(d)	(i)	Describe one legal implication which may arise from the increasing use of intelligent robots.	1PS
			<i>In the event of an accident, who is to blame? Owner/programmer/manufactururer. (1 mark)</i>	
		(ii)	How can this legal implication be addressed by the robot manufacturer?	1PS
			<ul style="list-style-type: none"> • <i>Disclaimer in documentation</i> • <i>Warnings eg light/buzzer to people</i> • <i>Make robot highly visible eg a bright colour</i> • <i>Any other valid</i> <p><i>Any valid point for 1 mark.</i></p>	

23	<i>Natural language processing</i> is one area of artificial intelligence that will enable many more people to use computers.		
	(a)	Ambiguity of meaning and similar sounding words both cause problems to developers of natural language processing.	
	(i)	Name one other type of problem, generated by everyday language, that developers face.	1PS
		<ul style="list-style-type: none"> • <i>Changing nature of language</i> • <i>Dialect/slang words</i> • <i>Any other valid</i> <p>(1 mark)</p>	
	(ii)	Give an example to show how your answer to (i) may cause the developer a problem.	1PS
		<ul style="list-style-type: none"> • <i>'Text' now accepted as a verb as well as noun (form of electronic communication vs, printed words)</i> • <i>Ken/minging (include slang words here too)</i> • <i>Any other valid to match with answer to (i)</i> <p>One example to match with (i) 1 mark</p>	
	(b)	A school pupil uses an automatic translator to help with his Spanish homework. Describe two problems that might be associated with using this translator.	2PS
		<ul style="list-style-type: none"> • <i>Phrases in natural English may not have direct correspondence in the target.</i> • <i>Grammar constructs in the two languages may not be the same.</i> • <i>Any valid point, don't allow 'program not very good'.</i> <p><i>Any two points for 1 mark each.</i></p>	

	<p>(c) Eliza was an early natural language application.</p> <p>Explain how Eliza would select a response to the following user input:</p> <p style="text-align: center;">“I find my homework hard.”</p>	2PS
	<ul style="list-style-type: none"> • <i>Identify keywords ('find', 'homework', 'hard'). (1 mark)</i> • <i>Generate a response relating to these words. (1 mark)</i> 	
	<p>(d) Explain how faster processors and more memory have improved the performance of modern <i>chatterbots</i>.</p>	2PS
	<ul style="list-style-type: none"> • <i>Faster processors: searching for key words (triggers)/response can be generated more quickly. (1 mark)</i> • <i>More memory: larger data sets can be held in RAM for speedier access by the program. (1 mark)</i> <p><i>Allow answers referring to the more graphical interface of modern chatterbots.</i></p>	
	<p>(e) Some modern game programs learn how their human opponent is playing and work out strategies to respond. Explain how the availability of parallel processing might aid the development of game playing programs.</p>	2PS
	<p><i>Different processors evaluating each possible response OR multiple paths being evaluated simultaneously (1 mark)</i></p> <ul style="list-style-type: none"> • <i>speeds up game play (or similar)</i> • <i>makes game play more realistic</i> • <i>intelligent selection between a number of options</i> • <i>allows development of more complex games/scenarios</i> <p><i>1 mark for any one valid point</i></p>	

24	Modern computers can now demonstrate many aspects of intelligence. Creativity and language processing are two aspects of intelligence which may be included as part of an artificial intelligence system.		
	(a)	Name and describe one other aspect of artificial intelligence which is currently being developed.	2KU
		<p><i>Note that the question is about aspects not applications.</i></p> <ul style="list-style-type: none"> • <i>Learning, enabling a computer to learn from previous outcomes.</i> • <i>Cognitive ability, collating facts/drawing conclusions.</i> • <i>Problem solving skills, responding on unfamiliar contexts.</i> • <i>Memory, recollection.</i> • <i>Vision, making sense of the environment.</i> <p><i>1 mark for name of aspect; 1 mark for description.</i></p>	
	(b)	Describe two reasons why creativity is difficult to include as part of an artificial intelligence system.	2PS
		<ul style="list-style-type: none"> • <i>All AI stems from a program so whatever arises from software is not creative.</i> • <i>Results of creativity are subject to interpretation and different people may interpret differently eg art.</i> • <i>Creativity is a complex process and not completely understood so hard to replicate.</i> <p><i>Any two valid points for 1 mark each.</i></p>	

25	A mobile phone shop uses an <i>expert system</i> to advise customers which phone is best for them. It is essential that the user interface in such a system offers <i>justification facilities</i> .		
(a)	(i)	Explain what justification facilities do.	2KU
		<i>Offer <u>why</u> the system needs the answer to a particular question (1 mark) and <u>how</u> it arrived at its advice. (1 mark)</i>	
	(ii)	Explain why these are important to the customer.	2KU
		<ul style="list-style-type: none"> • <i>Why: so that the customer knows the need for the answer.</i> • <i>How: allows customer to judge the advice OR review their answers.</i> • <i>General answer: gives customer greater confidence in the advice given.</i> <p><i>1 mark for each of two valid points</i></p>	
(b)	Explain two problems that the customer might experience when using this expert system.		2PS
		<ul style="list-style-type: none"> • <i>Knowledge base might not be up to date on either tariff or suppliers.</i> • <i>Dealing with machines rather than people.</i> • <i>Any other valid point.</i> <p><i>2 distinct points for 1 mark each.</i></p> <p><i>Answers such as 'power cut' are not enough unless supported by a clear description.</i></p>	
(c)	What is the role of the sales staff at the mobile phone shop during the testing stage of the development process?		1PS
		<ul style="list-style-type: none"> • <i>Beta testing/using the software in situ/reporting any faults to the developers (testing alone is not sufficient).</i> • <i>Supplying real world test data.</i> • <i>Any other valid point.</i> <p><i>1 mark for any point.</i></p>	

	(d)	A <i>neural network</i> could also be used to advise the customer.	
	(i)	Explain one difference between a neural network and an expert system.	2KU
		<ul style="list-style-type: none"> • <i>ES <u>given</u> all the facts and rules (1 mark) whereas ANS given details and <u>trained/learns</u>(1 mark)</i> • <i>ANS is comprised of interlinked layers/neurons (1 mark) whereas ES contains knowledge base, inference engine etc (1 mark)</i> • <i>ES advice able to be justified (1 mark) whereas ANS is non-deterministic (1 mark)</i> <p><i>1 mark for each of two valid points showing <u>difference</u> between ES and ANS.</i></p>	
	(ii)	Explain how the neural network could be trained.	3KU
		<ul style="list-style-type: none"> • <i>Set initial settings/weights/thresholds (1 mark)</i> • <i>Supply data and compare output (1 mark)</i> • <i>Rebalance weights to get required output and repeat process until actual results match expected (1 mark)</i> <p><i>Description of learning through iterative process (ANS).</i></p>	

26 The type of rope used for tying knots will affect the usefulness of the knot. Prolonged exposure to sunlight will reduce the strength of the rope and each type of rope has a sunlight rating, 1 is poor, 4 is excellent.



A rope seller has started to create a knowledge database about the type of rope he sells; this is part of it:

- | | | |
|----|--|--|
| 1 | fibre(sisal, sinks). | <i>Sisal is a fibre that sinks in water</i> |
| 2 | fibre(manilla, sinks). | |
| 3 | fibre(polythene, floats). | |
| 4 | fibre(polycot, floats). | |
| 5 | rating(sisal, 4). | <i>Sisal has a sunlight rating of 4</i> |
| 6 | rating(manilla, 4). | |
| 7 | rating(polythene, 2). | |
| 8 | rating(polycot, 3). | |
| 9 | used_on_boats(X) IF fibre(X, floats). | <i>Rope X can be used on boats if rope X floats</i> |
| 10 | sailing_in_med(X) IF used_on_boats(X) AND
rating(X,Y) AND
Y>2. | <i>Rope X can be used for sailing in the
Mediterranean if it can be used on
boats and has a rating Y which is greater than 2</i> |

	(a)	What would be the solution to the query? ?used_on_boats(X)	2PS
		<i>X=polythene (1 mark)</i> <i>X=polycot (1 mark)</i> <i>Answers must include 'X=' to gain the mark.</i>	
	(b)	(i) What is the solution to the query? ?NOT(fibre(cotton, floats))	1PS
		<i>True/Yes (1 mark)</i>	
		(ii) Explain why the program arrived at this solution.	2PS
		<i>fibre(cotton, floats) is false (1 mark)</i> <i>NOT(fibre(cotton, floats)) is true (1 mark for concept of inversion)</i>	
		(iii) What is the problem with this solution?	1PS
		<i>Any fact not in the knowledge base will return a value false, irrelevant of whether it is true or not. (1 mark)</i>	

(c)	<p>Assuming that a <i>depth-first search</i> is used, trace the first solution to the query</p> <p style="text-align: center;">?sailing_in_med(X)</p> <p>You must include the correct use of each of the following words in your trace.</p> <p style="text-align: center;">sub-goal, backtrack and instantiation (or instantiated).</p> <p>Use the line numbers to help your explanation.</p>	9PS
	<p><i>match at line 10, first sub-goal is used_on_boats(X)</i></p> <p><i>match at line 9, sub-goal is <u>fibre(X, floats)</u> 1 mark</i></p> <p><i>match at line 3 with <u>X instantiated to polythene</u> 1 mark</i></p> <p><i>second sub-goal is rating(polythene, Y), match at line 7, Y instantiated to 2</i></p> <p><i>third sub-goal <u>Y>2 fails</u> (so X=polythene not a solution) 1 mark</i></p> <p><i>backtrack to line 4, matches with <u>X instantiated to polycot</u> 1 mark</i></p> <p><i>second sub-goal is rating(polycot, Y), match at line 8, <u>Y instantiated to 3</u> 1 mark</i></p> <p><i>third sub-goal <u>Y>2</u> which succeeds, so <u>X=polycot is a solution</u> 1 mark</i></p> <p><i>Award 1 mark for each term of sub-goal, backtrack and instantiation used correctly <u>at least once</u> in the trace.</i></p>	

SECTION III – Part B – Computer Networking

27	A small sports clothing company decide to sell their goods via the Internet. Their web site is http://www.sportsclothingdirect.co.uk . As a result they now pay less on wages and rent.		
	(a)	State two additional benefits to a company of trading via the Internet.	2PS
		<ul style="list-style-type: none"> • <i>Increased customer base</i> • <i>24 hour trading 365 days per year</i> • <i>Any other valid, not covered in stem</i> <p><i>1 mark for each of two valid points</i></p>	
	(b)	The company is allocated a class C IP address instead of a class A. Explain why this is the case.	1PS
		<ul style="list-style-type: none"> • <i>They are a small company and have no need for the number of addresses that a class A offers (1 mark).</i> 	
	(c)	<p>The website is created using HTML. The first three lines of coding for a page are shown:</p> <pre style="margin-left: 40px;"><title>Welcome to Sports Clothing Direct <body> <i>Great deals at Sports Clothing Direct!!</i></pre> <p>Identify two errors present in this HTML code.</p>	2PS
		<ul style="list-style-type: none"> • <i>No <HTML> tag to start code.</i> • <i>No <head> tag</i> • <i>The </title> end tag is missing.</i> • <i>The italic and bold tags are nested incorrectly.</i> <p><i>1 mark for each of two valid points</i></p>	

	(d)	The company is keen to adapt the website so that it would be available to devices equipped with WAP technologies.	
	(i)	Describe two factors that the company should take into account when adapting the site for use with WAP technologies.	2PS
		<ul style="list-style-type: none"> • Amount of content (irrespective of nature of content) on each page • Reduced screen size • Amount of multimedia content (sounds, graphics etc) • Navigation method • Limited bandwidth available on WAP devices • Any other valid <p><i>1 mark for each of two valid points</i></p>	
	(ii)	Wireless Mark-up Language (WML) is used to produce Web content that can be read from WAP devices. Describe two ways in which WML differs from HTML.	2KU
		<ul style="list-style-type: none"> • Limited text formatting/range of tags • Limited support for tables and images/range of tags • Pages arranged in stacks of cards <p><i>1 mark for each of two valid points</i></p>	
	(e)	Explain how staff at the sports company may have been involved at the testing stage of the development of the website.	1PS
		<ul style="list-style-type: none"> • Beta testing, using in situ • Supplying test data • Any other valid <p><i>1 mark for each of two valid points</i></p>	

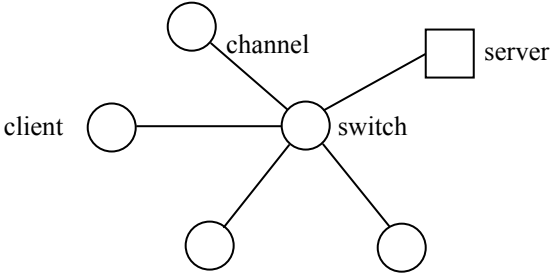
28	Gayle is a weather forecaster. She uses her computer to transmit data across networks in different parts of the United Kingdom.		
	(a)	Explain why it is important that networks are designed using international standards such as the <i>Open Systems Interconnection (OSI)</i> model.	1KU
		<ul style="list-style-type: none"> <i>To allow effective/accurate data transfer between disparate/different networks (1 mark).</i> 	
	(b)	When Gayle sends a file across the network the TCP/IP protocol is used. What part does the TCP/IP protocol play in the transfer of files over a network? Your answer must clearly identify which protocols are used at each stage.	5KU
		<ul style="list-style-type: none"> <i>TCP – File is broken into packets (1 mark). Each packet is given a sequence header (1 mark).</i> <i>IP – Data is given an address header (1 mark). Each data packet routed around network according to address (1 mark).</i> <i>TCP – File re-assembled at destination (1 mark).</i> <p><i>Answer must mention which protocol is required at each stage.</i></p>	
	(c)	A <i>Cyclic Redundancy Check (CRC)</i> is often used when sending data around a network.	
	(i)	Describe how CRC operates.	4KU
		<ul style="list-style-type: none"> <i>A calculation is carried out on the data.</i> <i>The result of this calculation is sent with the data.</i> <i>At destination the same calculation is carried out again.</i> <i>Results compared accepting data/requesting re-send as appropriate.</i> <p><i>1 mark for each bullet point. Note this is a minimum acceptable response.</i></p>	
	(ii)	Explain two ways in which CRC decreases network performance.	2PS
		<ul style="list-style-type: none"> <i>It will increase the transmission times as the calculations have to be done.</i> <i>Extra data is transmitted across the network.</i> <p><i>1 mark for each of two valid points</i></p>	

29	GraphicComs is a large graphic design company. It requires a backup strategy to minimise data loss. It intends to use a <i>backup server</i> , <i>mirror disks</i> and a <i>backup schedule</i> .	
	(a) How would GraphicComs use a backup server, mirror disks and a backup schedule to implement a backup strategy?	3PS
	<ul style="list-style-type: none"> • <i>Server – correct backup files/software would be installed on server (1 mark).</i> • <i>Mirror disks – several disks would be written to at the same time (1 mark).</i> • <i>Schedule – back-ups would be taken at regular intervals (1 mark).</i> 	
	(b) The company also puts in place disaster avoidance techniques. Name and describe one <i>disaster avoidance</i> technique that the company could use.	2KU
	<ul style="list-style-type: none"> • <i>Anti-virus software – find and remove viruses as they enter network.</i> • <i>Fault tolerant components – have “replacement” components readily available.</i> • <i>Uninterruptible power supply – backup battery that provides power should the main power source fail.</i> • <i>Regular maintenance – regularly inspect system (replacing components as required).</i> • <i>Firewall – software/hardware that analyses data coming into the network.</i> • <i>RAID – write data to several disks at the same time.</i> <p><i>1 mark for name, 1 mark for valid description. Note: must be avoidance, not recovery (ie backup strategy).</i></p>	

	(c)	This network uses CSMA/CD.	
	(i)	Describe how CSMA/CD operates.	4KU
		<ul style="list-style-type: none"> • <i>Node checks to see if data transfer is already taking place.</i> • <i>If not, attempts to transmit.</i> • <i>If two nodes attempt to transmit at same time OR if a collision is detected.</i> • <i>Node waits a random amount of time before re-transmitting.</i> <p><i>1 mark for each valid point</i></p>	
	(ii)	Explain why CSMA/CD is often used within networks.	2PS
		<ul style="list-style-type: none"> • <i>CSMA/CD is used to reduce the likelihood of data collisions.</i> • <i>Thus reduces the amount of data that would have to be re-transmitted.</i> • <i>Any other valid.</i> <p><i>1 mark for each of two valid points.</i></p>	

30	The Singh family purchases a home computer system and sign up for Internet access. The parents intend to use the Internet for on-line banking. They are however, worried about the security of on-line banking. Their bank's website states that it uses <i>encryption</i> when transferring sensitive information.		
	(a)	Explain two other ways in which the bank could ease the security concerns of the parents.	2PS
		<ul style="list-style-type: none"> • <i>Promote confidentiality/security of site by using, for example, adverts and/or policies within website.</i> • <i>For phishing – send emails to customers asking them to be vigilant of the URL they are accessing.</i> • <i>Advise vigilance of fraudulent e-mails asking for sign in details.</i> • <i>Recommendation of use of firewall etc</i> • <i>Bank could monitor transactions for unusual activity</i> • <i>Any other valid</i> <p><i>1 mark for each of two valid points. Note: HTTPS and SSL use encryption during data exchange.</i></p>	
	(b)	The children of the family are keen to purchase music on-line. They would like the files to download quickly.	
	(i)	Suggest one type of Internet connection that would help minimise the time spent downloading these music files.	1PS
		<ul style="list-style-type: none"> • <i>Cable, ISDN, ADSL, [do NOT accept "broadband" alone] (1 mark).</i> 	
	(ii)	Justify your answer.	1PS
		<ul style="list-style-type: none"> • <i>High transfer speed.</i> • <i>Any other valid.</i> <p><i>1 mark for any one valid point. Avoid double jeopardy.</i></p>	


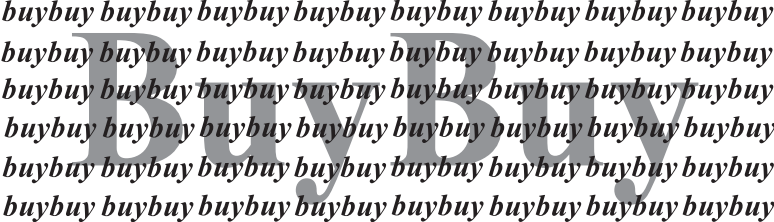
	(c)	The parents are concerned that their children spend too much time on the Internet. They believe that their children are not developing their social skills. Are the parents justified in their concerns? Explain your answer.	1PS
		<p><i>Yes</i></p> <ul style="list-style-type: none"> • <i>because entertainment is so readily available on-line the children may not need to socialise</i> • <i>parents see a need for face-to-face interaction.</i> <p><i>No</i></p> <ul style="list-style-type: none"> • <i>can use chat rooms, messenger type programs etc to interact.</i> <p><i>1 mark for <u>justification</u>.</i></p>	


31	In a hospital, data is held in a central server. All staff can access patient details such as name, address and contact details. Only doctors can access confidential information such as a patient's medical history and previous treatments.	
(a)	Describe how the access to information could be set up so as to ensure that the confidential information was only viewed by the correct personnel.	1PS
	<ul style="list-style-type: none"> • <i>Allocate <u>different levels of user rights</u></i> • <i>Any other valid</i> <p>1 mark</p>	
(b)	The hospital uses a star network. The network consists of one server, a switch and four client machines. Sketch this star network, fully labelling your diagram.	3PS
	<p>1 mark for correct topology of star 1 mark for labelling one <u>client</u>, one <u>channel</u>, <u>switch</u> and <u>server</u> 1 mark for central location of switch</p> <p><i>NOTE: do not penalise pupil if they do not have 4 client machines.</i></p>	

	(c)	Confidential data is sent around the network using <i>packet switching</i> .	
	(i)	Name the other method of switching data.	1PS
		<ul style="list-style-type: none"> • <i>Circuit switching (1 mark).</i> 	
	(ii)	Describe two advantages of using packet switching over the method named in part (i) when transmitting confidential data.	2PS
		<ul style="list-style-type: none"> • <i>Parts of messages may take different routes when network is congested/compromised (1 mark).</i> • <i>If data is intercepted it will not be the whole file (1 mark).</i> 	
	(d)	The doctors want to monitor the network activities of their employees.	
	(i)	Which law allows them to engage in this monitoring?	1PS
		<i>Regulation of Investigatory Powers Act (1 mark).</i>	
	(ii)	Describe two ways in which the doctors could use the powers given to them by this law to monitor the employees.	2PS
		<p><i>(Enlist Police help to...)</i></p> <ul style="list-style-type: none"> • <i>Intercept communications/email</i> • <i>Set up surveillance programs/monitor web or file access</i> • <i>Use covert human intelligence sources</i> • <i>Access encrypted data</i> <p>1 mark for each of two valid points.</p>	
	(iii)	Explain how a firewall is used to monitor Internet access in the hospital.	2PS
		<ul style="list-style-type: none"> • <i>Monitors all comms ports (1 mark) and blocks unauthorised access (1 mark).</i> <p><i>OR</i></p> <ul style="list-style-type: none"> • <i>Check websites against safe/blocked list (1 mark) and block unauthorised access/downloads (1 mark).</i> <p><i>Note: Answers should relate to Internet access not email.</i></p>	

SECTION III – Part C – Multimedia Technology

32	A Web design company is creating a website for BuyBuy supermarket.		
	(a)	The website is to contain multimedia elements such as video.	
		(i) Describe one benefit of including video in the website.	1PS
		<ul style="list-style-type: none"> • <i>Multimedia will make it more interesting and may attract more customers.</i> • <i>Would allow a virtual tour through the aisles when shopping on-line.</i> • <i>Any other valid.</i> <p><i>1 mark for any sensible reason in context. Note: Answers must demonstrate <u>some</u> grasp of Higher knowledge</i></p>	
		(ii) Describe one technical implication for the customer of including video in the website.	1PS
		<ul style="list-style-type: none"> • <i>Video requires a higher bandwidth/takes longer to download than text-based pages.</i> • <i>Customer may not have correct player/plugin.</i> • <i>Any other valid.</i> <p><i>1 mark for any sensible reason in context. Note: must be a technical reason.</i></p>	
	(b)	A container file is used to send multimedia to the Web design company. What is a container file?	1KU
		<p><i>Container file holds a variety of data/file types OR Container file holds files in a compressed format.</i></p> <p><i>1 mark</i></p>	

(c)	<p>The supermarket logo is shown below.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Figure A</p>  </div> <div style="text-align: center;"> <p>Figure B</p>  </div> </div>	
	(i) What additional attribute is present in the logo in Figure B?	1PS
	<i>Transparency (1 mark). Note: layering is not an additional attribute.</i>	
	(ii) Name one file type which supports this attribute.	1PS
	<i>GIF, PNG (allows pixels to be partially transparent) (1 mark).</i>	
(d)	<p>The final image created is 2 x 3 inches at 2048 dpi and has a file size of exactly 72 Mb.</p> <p>What is the colour depth of the image?</p>	4PS
	<p><i>Number of pixels is 2048 x 2048 x 2 x 3 = 25165824 pixels (1 mark).</i> <i>Number of bits is 72 x 1024 x 1024 = 603979776 bits (1 mark) (Accept the result in bytes 75497472 bytes)</i> <i>= 603979776 / 25165824 = 24 bits per pixel (1 mark)</i> <i>= 24 bit colour depth (1 mark)</i></p> <p><i>NOTE: if correct answer of 24 bits is given with no working, full credit must be given as correct working must be assumed.</i></p>	

	<p>(e) The supermarket is also planning an interactive multimedia information service within their stores.</p> <p>Which type of application software would you recommend for the creation of this information service? Justify your answer.</p>	2PS
	<p><i>(Web) Authoring software</i> <i>Used to create an interactive application which incorporates multimedia elements. Allows creation of code to control the features of the service.</i></p> <p><i>Presentation software</i> <i>Used to create series of screens, does not have to be linear, can include hyperlinks and multimedia elements.</i></p> <p><i>1 mark</i> for name of a <u>type</u> of application software – do not accept WYSIWYG, Powerpoint or any named software. <i>1 mark</i> for explanation/justification of why it is appropriate. Note: Avoid double jeopardy resulting from use of name etc</p>	
	<p>(f) The image on the opening screen of the information service is shown below. The image has bands of colour instead of a gradual transition between colours.</p> <p>Name and describe one technique that could be used to improve the appearance of the bands of colour.</p> <div style="text-align: center;">  </div>	2PS
	<p><i>Dithering (1 mark).</i> <i>Simulates extra colours by mixing allowed colours together (to improve appearance/gradation of colour) (1 mark).</i></p>	

33	Lewis has purchased some music on-line. His computer contains a sound card which is used when playing the music.		
	(a)	Describe two features of a sound card.	2KU
		<ul style="list-style-type: none"> • <i>To allow hardware decoding of sound files (DSP).</i> • <i>Conversion from digital to analogue data (DAC).</i> • <i>Conversion from analogue to digital data (ADC).</i> • <i>Buffering of data</i> • <i>Any other valid</i> <p><i>1 mark for each description (maximum of two), name/initials on own is insufficient.</i></p>	
	(b)	It is often necessary to <i>normalise</i> a sound file.	
	(i)	Why is it often necessary to normalise a sound file?	1KU
		<i>Some sounds may be too loud or too quiet in a recording. 1 mark</i>	
	(ii)	How is <i>normalisation</i> achieved?	1KU
		<p><i>Sound levels are adjusted so...</i> <i>...they are nearer to the average level of all of the sounds that make up the recording OR the range of amplitudes is reduced</i></p> <p><i>1 mark</i></p>	
	(c)	Describe two ways in which compression can be achieved using the MP3 file format.	2KU
		<ul style="list-style-type: none"> • <i>Sounds outwith normal audible range are removed.</i> • <i>When 2 similar sounds occur at the same time and one is significantly louder, then the quiet one is removed.</i> • <i>Other valid.</i> <p><i>Must be 2 discrete answers for 2 marks.</i></p>	

	(d)	Calculate the uncompressed file size of a 2½ minute audio clip recorded in stereo at 44.1kHz using 65536 different sounds. Show all your working.	4PS
		<p>= (150×44100) (1 mark) $\times 16$ bits (1 mark) $\times 2$ (1 mark)</p> <p>= 211680000 bits</p> <p>= 25.23Mb (1 mark)</p>	

34	(a)	Vanessa buys a 2 Gb USB pen drive, a solid state storage device, and connects it to the USB port on her computer. The manufacturer claims that data could be transferred at rates up to 480 megabits per second. The actual transfer rate is 125 megabits per second. Suggest one reason for this.	1PS
		<ul style="list-style-type: none"> • Stick may be USB2, but computer only has USB1 interface/USB1 does not support 480 mbps. • Computer may be multi-tasking, busy doing other tasks. • Any other valid. <p>1 mark</p>	
	(b)	Vanessa is transferring a 1.4 Gb file from the pen drive to the hard drive of her computer. How long will it take to transfer this file at 125 megabits per second?	2PS
		<p><i>1.4 x 1024 x 8 Mbits (1 mark) divided by 125 Mbps = 91.75 seconds (1 mark)</i></p> <p><i>OR</i></p> <p><i>1.4 x 1024 x 1024 x 1024 x 8 bits (1 mark) divided by 125 000 000 bps = 96.21 seconds (1 mark)</i></p>	
		Multimedia technology is constantly improving. Improvements include communications and storage technologies.	
	(c)	One recent development is Firewire.	
		(i) What is Firewire used for?	1KU
		<p><i>Connecting any sound/video equipment/hard disk drive/scanner to computer system.</i></p> <p><i>Note: Do not accept simplistic answers such as “transferring data”</i></p> <p>1 mark</p>	

		(ii) State one reason why Firewire is a popular choice for communications.	1KU
		<ul style="list-style-type: none"> • <i>Cross platform</i> • <i>Fast transfer of data (400 or 800 Mbps)</i> • <i>Allows easy connection of digital equipment</i> • <i>Any other valid</i> <p><i>1 mark for any one valid response.</i></p>	
	(d)	State two technological factors influencing the growth of multimedia communications.	2PS
		<ul style="list-style-type: none"> • <i>Increased bandwidth (allows more data to be transferred in a reasonable time).</i> • <i>Wireless capabilities make communication more accessible.</i> • <i>Miniaturisation of hardware.</i> • <i>Any other valid.</i> <p><i>1 mark for each of two valid points.</i></p>	

35	The department of medicine use various graphics packages for teaching.		
	(a)	The students use vector graphics to create 2D diagrams. Describe two advantages of using vector graphics over bit-mapped graphics.	2KU
		<ul style="list-style-type: none"> • <i>More storage efficient than bit-map storage for simple graphics.</i> • <i>Output quality matches hardware capability.</i> • <i>Resolution independent/displayed at highest resolution of output device</i> • <i>Allows objects to be layered.</i> • <i>Any other valid.</i> <p><i>1 mark for each of two valid advantages.</i></p>	
	(b)	The images created have to be changed into 3D. Describe two additional attributes used for a 3D image.	2PS
		<ul style="list-style-type: none"> • <i>Angle of rotation to view object in different orientations.</i> • <i>(Surface) Texture to give surface definition.</i> • <i>Shadow to give appearance of (direction of) light.</i> • <i>Z co-ordinate to give extra/third dimension of 3D shape.</i> • <i>Any other valid.</i> <p><i>1 mark for each of two valid descriptions, zero for simply naming attributes.</i></p>	
	(c)	State one method of creating 3D images.	1KU
		<ul style="list-style-type: none"> • <i>Using VRML code OR suitable graphics software (1 mark).</i> 	

	(d)	A simulation program is used to train students on routine operations. The simulation is currently run on flat screen monitors. The lecturers have read an article about Real 3D displays.	
	(i)	State one advantage of using a Real 3D display over a flat screen monitor.	1PS
		<ul style="list-style-type: none"> • <i>Allows viewing of 3D objects from different angles</i> • <i>Any other valid</i> <p>1 mark</p>	
	(ii)	State one disadvantage of using a Real 3D display over a flat screen monitor.	1PS
		<p><i>Very expensive compared to traditional monitors.</i></p> <p>1 mark</p>	
	(e)	A DVD does not have sufficient storage capacity to store the simulation program. A hard disk has sufficient capacity but is still unsuitable.	
	(i)	State a suitable alternative optical backing storage technology.	1PS
		<p><i>Holographic storage (1 mark)</i></p> <p><i>OR</i></p> <p><i>Blu-Ray Disk (1 mark)</i></p>	
	(ii)	Explain why this method of storage is more suitable.	1PS
		<ul style="list-style-type: none"> • <i>Holographic storage has a high capacity, fast access times.</i> • <i>Hard disk transfer rates not fast enough for simulation to appear life like.</i> • <i>Any other valid.</i> <p><i>OR</i></p> <ul style="list-style-type: none"> • <i>Blu-ray has capacity of 50Gb (soon to be 250 Gb)</i> • <i>Blu-ray has transfer rate of 48 Mbps (as opposed top DVD of 36.6 Mbps)</i> <p>1 mark for any valid response.</p>	

36	The band Atomic Heatwave have just finished filming a video for their latest single at a castle.		
	(a)	State an item of hardware required to transfer the digital video from the camera to the computer.	1KU
		<ul style="list-style-type: none"> • <i>USB port/card/cable</i> • <i>Firewire port/card/cable</i> • <i>Video (capture) card</i> • <i>Bluetooth card/dongle</i> <p><i>1 mark for any valid.</i></p>	
	(b)	Describe how video is compressed and stored using the MPEG format.	3KU
		<ul style="list-style-type: none"> • <i>Key frames are stored (one every five/ten/etc). (1 mark)</i> • <i>Each frame is compressed using lossy compression (JPEG is used) (1 mark)</i> • <i>Only changes between key frames are stored. (The data that stays the same in successive frames is removed) (1 mark)</i> 	
	(c)	Container files are also used in multimedia. State one example of a typical “container” file for video.	1KU
		<ul style="list-style-type: none"> • <i>RIFF, AVI (or any other container file used for video data)</i> <p><i>1 mark</i></p>	

	(d)	(i)	Name two features of video editing software that may be used when the Atomic Heatwave video is being put together.	2PS
			<p><i>Any two of:</i></p> <ul style="list-style-type: none"> • <i>timeline</i> • <i>transition</i> • <i>sequencing</i> • <i>audio</i> <p><i>1 mark for each of two features. Note: Storyboarding is a planning technique</i></p>	
		(ii)	Describe the two features named in part (i).	2PS
			<ul style="list-style-type: none"> • <i>Timeline – displays the elements eg the clips being used, the song track, any titles to be displayed etc.</i> • <i>Transition – how clips are joined together eg dissolve between different camera shots.</i> • <i>Sequencing – organising the order of the clips eg clips to be in order of daylight to dusk.</i> • <i>Audio – incorporate the music track onto the video so that it is synchronised with singer.</i> <p><i>1 mark for each description related to the context.</i></p>	
	(e)		Atomic Heatwave wish to put video onto their website. The file size is extremely large. Other than compression, describe two methods that could be used to reduce the file size.	2PS
			<ul style="list-style-type: none"> • <i>Reduce the frame rate</i> • <i>Reduce the bit depth</i> • <i>Reduce the resolution</i> • <i>Crop each frame</i> <p><i>1 mark for each of two valid methods.</i></p>	

[END OF MARKING INSTRUCTIONS]