2011 Computing

Higher

Finalised Marking Instructions

SECTION I

1	State the largest whole number that can be stored as a 10-bit positive integer.	**1 PS**
	*1023 OR 2^{10} -1 (**1 mark**)*	

2	Name and describe a method for measuring the performance of computers.	**2 KU**
	• *Clock speed (**1 mark**) the number of clock cycles per second (**1 mark**)* • *MIPS (**1 mark**) the number of millions of instructions per second (**1 mark**)* • *FLOPS (**1 mark**) the number of floating point operations per second (**1 mark**)* • *Application based tests (**1 mark**) assesses computer performance in doing a series of real-world tasks (**1 mark**)* ***1 mark** for method and **1 mark** for description.*	

3	Data storage compensates for differences in speed between computers and peripherals. This is achieved through *buffering* and *spooling*.		
	(a)	Explain the difference between buffering and spooling.	**2 KU**
		• *Buffering uses RAM (**1 mark**) Spooling uses hard disk (**1 mark**)* • *Buffering is used after data is received (**1 mark**) Spooling is used before sending data (**1 mark**)* ***1 mark** each half of clear difference, **max 2 marks**.*	
	(b)	Compensation for differences in speed between the computer and peripherals is one function of an *interface*. State **two** other functions of an interface.	**2 KU**
		• *data format conversion* • *voltage conversion* • *protocol conversion* • *(handling of) status signals* *Note: two valid examples from each function, eg parallel to serial and analogue to digital – award 2 marks* *Any two of the above for **1 mark each**, **max 2 marks**. Note: data storage is a mechanism used for compensating for speed differences.*	

4	**(a)**	State the **type** of virus that may affect a computer during the start up process.	**1 KU**
		*Boot sector virus (**1 mark**)*	
	(b)	*Replication* and *camouflage* are two *virus code actions*. State **two** other virus code actions.	**2 KU**
		• *Watching (NOT waiting)* • *Delivery* ***1 mark** each, **max 2 marks**.*	

5	State **one** advance in computer **hardware** that has led to the increased use of computer networks.	**1 KU**
	• *Faster processors/clock speed* • *Parallel/multi-core processors* • *Larger main memory capacity* • *Larger backing storage* • *Faster data transfer rates/bandwidth* • *Wireless technology* • *NICs built into motherboards* • *Any other valid* *Any one of the above for **1 mark**.*	

6	**(a)**		Describe an example in which an image stored as a vector graphic could have a larger file size than if the same image was stored in a bitmapped format.	**2 PS**
			• *Vector graphic with many stored objects (**1 mark**) file size of a bitmap does not increase as objects are added (**1 mark**)* • *Vector graphic may store data on shapes hidden behind others (**1 mark**) bitmap is single layer & does not store other data (**1 mark**)* • *File size of a vector graphic increases as number of objects increases (**1 mark**) whereas a bitmap always stays the same size (**1 mark**)* ***2 marks** for a valid example with explanation.*	
	(b)		A bit mapped graphic has a *bit-depth* of 24 bits and a *resolution* of 300dpi.	
		(i)	State the number of colours that may be represented in this graphic.	**1 PS**
			*2^{24} OR 16777216 colours (**1 mark**)*	
		(ii)	State the effect that increasing the bit-depth will have on the file size of the graphic.	**1 PS**
			*File size will increase (**1 mark**)*	

7	*Analysis* is the first stage of the software development process.			
		(a)	Name the document produced at the end of the analysis stage.	**1 KU**
			*Software/problem/program/requirements specification (**1 mark**)*	
		(b)	Explain why the production of this document could be an *iterative* process.	**1 PS**
			• *Problem not fully specified at the first meeting with the client* • *Further refinement/modification/clarification of the problem may be necessary* • *Client disagreement with details given in specification* *Note: it's iteration within the analysis stage to produce the software specifcation* ***1 mark** for any valid. Points may be expressed in a number of ways.*	

8	*Pseudocode* is a design notation often used during the software development process.			
		(a)	Pseudocode should include *data flow*. State the purpose of data flow.	**1 KU**
			• *To identify the data/variables used at each step of the design* • *To show what data is passed to/from/in/out of procedures* • *To supply data to subprograms* • *Identify which variables will be passed as parameters* • *Identify mechanism of parameter passing (IN, OUT, IN/OUT)* • *Other valid* ***1 mark** any valid.*	
		(b)	Other than data flow, state **two** benefits, to a programmer, of a design written in pseudocode.	**2 KU**
			• *Easy to understand/it uses English words* • *Easy to convert into program code/line by line translation* • *Structure of pseudocode reflects structure of modular code* • *(Numbered) steps to show order/logic* • *Indentation to emphasise command structures* • *Pseudocode is not language specific* • *Other valid* ***1 mark** for any valid, **max of 2 marks**.*	

9	State what is meant by the term “boolean variable”.	**1 KU**
	*Stores value true/false, 1/0 (**1 mark**)* *Note: “Uses 2 states” is insufficient for mark*	

10	Software is usually written using *subprograms*. Two types of subprogram are *procedures* and *functions*.		
	(a)	State how the use of subprograms increases the *maintainability* of a program.	**1 KU**
		• *Sections/subprograms are easily identified/implemented/tested/de-bugged/edited* • *Sections/subprograms increase readability* • *Independent subprograms can be added or removed easily* • *Any other valid response* ***1 mark***	
	(b)	Readability of code affects maintainability. Other than using subprograms, state **one** way to improve **readability** of code.	**1 KU**
		• *Internal Commentary* • *Meaningful variable names* • *Effective use of white space/indentation/blank lines* • *Other valid* ***1 mark***	
	(c)	Explain **one** difference between a procedure and a function.	**2 PS**
		• *A function can only return a single value (**1 mark**). A procedure can return any number of values (**1 mark**)* • *The value of a function can be assigned to a variable (**1 mark**) a procedure has no value (**1 mark**)* ***1 mark** for each part of any valid comparison/difference, **max of 2 marks**.*	

11	A program contains three variables, of **the same type**, with the following values.			
	variable1 8	variable2 4	variable3 84	
	The program is written in language called SQAM. It contains the line of code shown below. The symbol **?** represents a particular operation. variable3 = variable1 **?** variable2			
	(a)	The value **84** is assigned to **variable3**. State the single common operation carried out by the **?** symbol.		**1 PS**
		*Concatenation (accept '&') (**1 mark**)* *Note: Do **not** accept (10*var1+var2), as this is neither "single" nor "common".* *Also reject '+' as it is ambiguous and usually refers to numerical/arithmetical addition, which is wrong.*		
	(b)	State the *data type* that must have been used for **all three** of the variables.		**1 PS**
		*String (**1 mark**)*		

12	A *macro* can be used within application software to automate a task.		
	(a)	Name the *type* of programming language used to create macros.	**1 KU**
		*Scripting language (**1 mark**)*	
	(b)	Other than saving time, for example during writing or testing, state **two** further benefits of using macros.	**2 KU**
		• *Can create operations that are not readily available within the menus of the application/increase functionality* • *A novice user can more easily perform complex actions* • *Complex actions can be triggered by simple combination of key presses, making it easier to perform* • *Access to low level operations (not available in menus)* • *Adapt/alter user interface* • *Same sequence of actions carried out each time the macro is run* • *Other valid* ***1 mark** each of two valid, **max of 2 marks**.*	

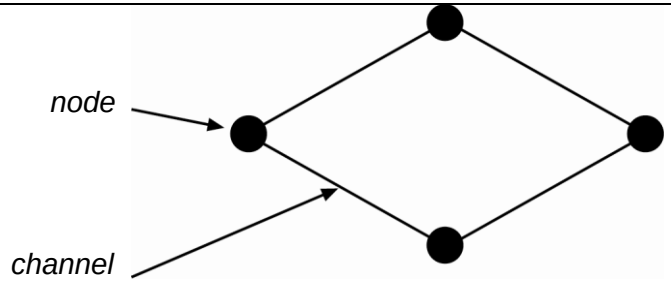
SECTION II

13	Paula buys a new laptop computer which has 4 Gigabytes of *main memory* and 12 Megabytes of *cache* memory.			
	(a)	State **two** differences between main memory and cache memory.		**2 KU**
		• *Cache memory is more expensive (per megabyte)* • *Cache memory has faster <u>access</u> ("not just faster")* • *Cache is Static RAM (SRAM) instead of Dynamic RAM (DRAM)* • *Cache is on (or immediately adjacent to) the processor* *Any two of the above for **1 mark each, max 2 marks**. Note: NOT 'closer to processor' without further detail.*		
	(b)	The computer has a **maximum** addressable memory of 16 Gigabytes. Its *address bus* width is 32.		
		(i)	Calculate the width of the *data bus*	**3 PS**
			• *16 GB = 137438953472bits* • *2^32 = 4294967296 memory locations* • *(13743895347)/(4294967296) = 32 (bits or lines)* • *2^32 * d = 16 GB* • *d = 137438953472bits/4294967296* • *d = 32* *Note: 2^32 – 1 mark, resolving the units – 1 mark, final answer 1 mark* ***1 mark each, max 3 marks**.* • *2^{32} = 4 G* • *16/4 = 4 bytes* • *4 × 8 = 32 (bits or lines)*	

		(ii)	State why computers do not come with the maximum addressable memory installed.	**1 PS**
			• *Cost of RAM* • *Most programs do not require maximum RAM to be installed* • *Multiple addresses per location/byte addressable memory* • *Some addresses assigned to I/O ports (memory mapped I/O)* • *Other valid* ***1 mark** for any one valid point.*	
		(iii)	State the effect that adding **one** new line to the address bus would have on the maximum addressable memory.	**1 PS**
			*Addressable memory size <u>doubles/increased to 32 Gb</u> (**1 mark**). Note: 'Memory size is increased' is insufficient.*	
	(c)	Describe the function of each of the following in a memory *read* operation.		**3 PS**
			• address bus. • data bus. • control lines.	
			• *Address bus carries/holds/transfers memory address (**1 mark**)* • *Data bus carries/holds/transfers data from memory location/to the processor (**1 mark**)* • *Read line is activated/flagged (**1 mark**)*	

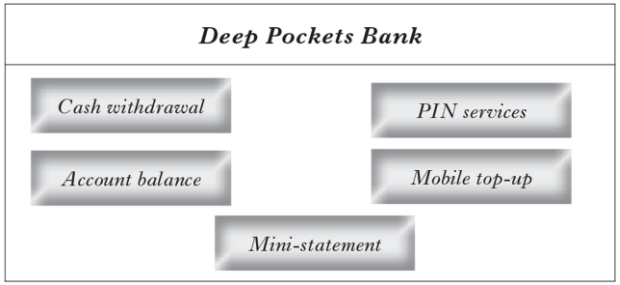
	(d)	The laptop computer comes with several *utility programs* including a *disk defragmenter*.		
		(i)	State what is meant by the term “utility program”.	**1 KU**
			• *Type of systems software that carries out a housekeeping/maintenance/support task* • *Systems software which is not part of the main operating system* • *Other valid* ***1 mark** for any one valid point.*	
		(ii)	Fragmentation of the hard disk decreases the performance of the computer. Explain why performance decreases.	**2 PS**
			• *Parts of file/unused blocks are spread across disk surface* • *Each separate block/part of file requires a separate disk access* • *Slows down the loading/writing of files/multiple disk access for single file* ***1 mark** for each of two valid bullets, **max 2**.*	
	(e)	The laptop computer has anti-virus software. State an *anti-virus software detection technique*.		**1 KU**
		• *Checksum* • *Heuristic detection* • *(Use of) virus signatures* • *Memory resident monitoring* ***1 mark** for any one above, **max 1 mark**.*		

14	Murray Components is a small business that sells computer hardware. They have a shop that employs four people.			
	(a)	Networks can be set up as either *peer-to-peer* or *client server*.		
		(i)	In terms of data backup, describe **one** difference between a peer-to peer network and a client server network.	**2 KU**
			• *A client server network allows for centralised backup as all data stored on the server* • *Peer-to-peer stored files across all machines so each machine has to be backed up* ***1 mark each, max 2 marks**.*	
		(ii)	Murray Components have a peer-to-peer network with four workstations. Describe **one** reason why they may have chosen a peer-to-peer network.	**2 PS**
			• *No additional server/network operating system cost (**1 mark**) as peer-to-peer does not need a server/network OS (**1 mark**)* • *Easy to extend (**1 mark**) as they only need to connect further machines to switch/hub etc (**1 mark**)* • *Less technical knowledge required (**1 mark**) as they do not have to configure clients/server (**1 mark**)* • *Security not an issue (**1 mark**) due to closed environment (**1 mark**)* • *Other valid reason (**1 mark**) with suitable explanation (**1 mark**)*	

	(b)	Murray Components are advised that a *ring topology* is not the most suitable topology to use for their LAN.		
		(i)	Draw a **labelled** diagram of a ring topology.	**2 KU**
			 *Note: Number of nodes are not specified in this part of the question so any number of nodes is correct* ***One mark*** *for correct diagram.* ***One mark*** *for correct labels – Only node & channel are acceptable labels*	
		(ii)	State a more suitable topology and state **one** advantage it has over a ring topology.	**2 PS**
			*Star (**1 mark**)* • *as whole network does not fail due to single channel failure* • *is easier to extend by adding another branch* • *any other valid* *(**1 mark** for reason)* *Bus (**1 mark**)* • *simpler/easier to set up as it is a single wire* • *easy to extend, as devices just connect to spine* • *any other valid* *(**1 mark** for reason)* *Note: Mesh is not suitable but credit may be given for a valid justification, ie multiple routes avoiding channel failure*	

	(c)	Murray Components requires a network printer to print advertising leaflets.		
		(i)	State **two** technical requirements that should be considered when selecting a suitable printer.	**2 PS**
			• *Print resolution/dpi* • *Number of colours/colour depth/black & white/grey scale* • *Print speed/ppm* • *Buffer capacity/amount of RAM* • *Type of interface/data transfer speed/serial to parallel* • *Operating System/Driver* *Note: Avoid physical requirements such as volume of paper tray or desktop footprint*	
		(ii)	State **two** roles of the *operating system* and describe how each are used to ensure that data is printed correctly.	**2 KU/ 2 PS**
			• *Manage processes/Resource allocation (**1 mark**) ensures processor time and memory are allocated to the process (**1 mark**)* • *Input output management (**1 mark**) sends and receives signals from the printer (**1 mark**)* • *Memory management (**1 mark**) allocates memory and locates data in memory to be sent to printer (**1 mark**)* • *Interpret user commands (CLI) (**1 mark**) receives user commands to print data (**1 mark**)* • *File Management (**1 mark**) will locate and retrieve the file from backing storage (**1 mark**)* • *Error reporting (**1 mark**) will report any problems with the printer, eg Printer out of paper etc. (**1 mark**)* ***1 mark** for naming each function and **1 mark** for how it operates during printing, **max 4 marks**.*	
	(d)	State **one** function of a *print server*.		**1 KU**
		• *Provides a queuing facility for print jobs* • *May maximise efficiency of printer use by distributing jobs* • *Stores (multiple) print jobs/jobs from (multiple) computers* • *Organises/prioritises printing queue* • *Other valid* ***1 mark** for any valid point.*		

	(e)	Murray Components starts to sell much more *solid state* storage. State **two** reasons why solid state storage is becoming more popular.	**2 PS**
		• *Solid state storage is more robust than mechanical hard drive* • *Capacities of solid state storage are increasing* • *Decreasing price of solid state* • *SSD has faster access times* • *On board encryption facility* • *Lower power requirements* • *SSD is quieter than a mechanical hard drive* • *Any other valid* *Note: Not just small/portable/lightweight – too trivial* ***1 mark** for each of two valid points, **max 2 marks**.*	

15	RightIT, a software company, is currently developing a cash machine program for a bank. The cash machine will offer five options to customers.			
				
	(a)	RightIT decided to use an *event-driven* programming language to write the software. State **two** reasons why an event-driven programming language is suitable for this software.		**2 PS**
		• *Code is attached to on-screen events eg buttons/Events trigger the code* • *Predefined routines for the creation of buttons/form/GUIs etc* • *Flow of control is determined by user actions* ***1 mark** any valid, **max of 2 marks**.*		
	(b)	**(i)**	State **one** other type of programming language RightIT could have used for this software.	**1 PS**
			*Procedural (**1 mark**).* *Note: scripting or declarative are generally not suitable for this task.*	
		(ii)	Justify why it would also have been suitable.	**1 PS**
			• *Use of subprograms, one for each service on offer* • *Program control using sequence – to go through initial identification procedure, and selection – to carry out chosen service* • *Range of data types are available* ***1 mark** for reason.*	

	(c)	The options selected during a day are stored in a list. The bank would like the software to calculate the number of times the **mobile top-up** option appears on this list. Use pseudocode to design an algorithm to carry out this calculation.			**4 PS**
		Total=0 *For each option() chosen that day* *If option(current) = mobile top-up then* *add 1 to total* *end if* *next transaction*	***1 mark** for initialising* ***1 mark** loop with termination* ***1 mark** if...endif with correct condition* ***1 mark** assignment*	*Note: End If is unnecessary if the IF line is all on one line or if indentation makes it clear that the IF is terminated*	
	(d)	Once the software has been written RightIT carry out *systematic* testing. Explain how systematic testing is carried out.			**2 KU**
		• *Testing is planned in advance/creation of a test plan* • *which includes test data to be used and the expected results* • *will be followed in a logical order* • *Involves testing of subprograms/subroutines/components/modules/programs individually and together* ***1 mark** for each of two valid, **max of 2 marks**.*			
	(e)	The bank is anxious that RightIT also carries out *comprehensive* testing on the software. State what is meant by comprehensive testing.			**1 KU**
		• *Testing is as thorough as possible (**1 mark**)* • *Covers a wide/full range of possibilities (**1 mark**)* • *Data should in range, out of range and boundary data (**1 mark**)* ***1 mark** for any 1 bullet*			

	(f)	The final version of the software is ready to be distributed to the bank. A *compiler* is chosen as the most suitable translator. Explain why a compiler is suitable at this stage.	**2 PS**
		• *Compiled version of code can be saved (**1 mark**), no need for translation every time program is run (**1 mark**)* • *Will not be translated each time program is run (**1 mark**), more processor efficient (**1 mark**)* • *Translator software not required (**1 mark**), more memory efficient (**1 mark**)* • *Compiled version is saved (**1 mark**) details of code are protected from theft/alteration/copying (**1 mark**)* • *Any other valid point (**1 mark**) explanation of consequence (**1 mark**)* ***max of 2 marks**.*	
	(g)	Several months after the software has been in use, the bank asks RightIT to include another option in the menu. This option should allow customers to withdraw cash in Euros. Name the **type** of *maintenance* required and justify your answer.	**2 PS**
		*Perfective (**1 mark**)* *A new feature is being added that was not originally required (**1 mark**)*	

16	Sidney is an experienced programmer. He decides to write a book called "The Good Programming Guide".			
	(a)	Chapter One of the book is entitled "Characteristics of a well written program". Two characteristics of a well written program are *reliability* and *efficiency*.		
		(i)	Define the term "reliable".	**1 KU**
			• *Software performs as predicted on duplicated test runs* • *Software will not stop due to design flaws* • *Output is correct for all specified inputs* ***1 mark** for any valid point.*	
		(ii)	Explain **one** way in which a program can be written to make it efficient in terms of **processor** usage.	**2 PS**
			• *No unnecessary code is included in the program (**1 mark**), processor not required to carry out unnecessary commands (**1 mark**)* • *Minimise the number of disk accesses/peripherals (**1 mark**), reducing time processor will have to stand idle (**1 mark**)* • *Simple user interface (**1 mark**) as complex interfaces take some time to draw etc (**1 mark**)* • *Use of Nested IFs/Case statements (**1 mark**) to logically structure code to avoid testing unnecessary conditions (**1 mark**)* • *Valid programming example (**1 mark**) explanation of processor efficiency (**1 mark**)* ***2 marks** for any valid full description of one point.*	
	(b)	A well written program should make use of *parameter passing*.		
		(i)	State the **purpose** of an *in parameter*.	**1 KU**
			• *Current value (of variable) passed into a subprogram for use* • *To allow data to be passed by value* • *Protect (original value of) variable from change by subprogram* ***1 mark***	
		(ii)	State the **purpose** of an *out parameter*.	**1 KU**
			• *Data/variables (created within procedure and only) passed out of a subprogram* • *Brand new variable is passed out of subprogram* ***1 mark***	

	(c)	Chapter two of the book is entitled 'Being a team player'. Sidney is keen to emphasise that on most projects there will be a team of programmers writing the software. Describe **one** example of how a programming team can ensure they will work together effectively.		**2 PS**
		• *Programmers will each be writing individual subprograms for the software required, (**1 mark**) reducing implementation time OR so they must collaborate via meetings/project manager/detailed plan (**1 mark**)* • *Will discuss how to implement the design/get help from more experienced programmer/discuss testing (**1 mark**) to reduce time wasted/find and solve problems earlier/ensure testing is systematic and comprehensive (**1 mark**)* • *Any other valid technique/topic (**1 mark**) and description (**1 mark**)* ***1 mark** for any valid technique/topic, **1 mark** for <u>how</u> it makes them effective.*		
	(d)	Another chapter is entitled 'Saving time whilst programming' A *module library* will save programmers time as they will not have to code or test these modules independently. State **one** further benefit of making use of a module library.		**1 KU**
		• *Can carry out a complex operation that they could not write themselves* • *Do not have to design the solution to the subproblem* ***1 mark** for any valid.*		
	(e)	When working with data, the use of *1-D arrays* can save time.		
		(i)	State **two** characteristics of a 1-D array.	**2 KU**
			• *a list of data/(fixed) number of items* • *items are the same data type/array has a single data type* • *position of data identified by its position/index/element/subscript* ***1 mark** for each of two valid points.*	

		(ii)	Data can be stored using individual variables or using a 1-D array. Describe how the use of a 1-D array can save time when writing a program compared to several individual variables.	**2 PS**
			• *Parameter passing list will use one array (**1mark**) rather than a list of variables (**1 mark**)* • *Do not need to write a line of code to manipulate each data item individually, (**1 mark**) operation can be performed on each item in the array using a loop (**1 mark**)* ***2 marks** for full description of one point.*	
	(f)	Sidney sets a short programming challenge at the end of each chapter. One of these programs involves identifying a computing term from another computing related word. For example, “ram” from “program” Using code from a programming environment with which you are familiar, show how you would extract the term “**ram**” from “**program**”, when “program” has been assigned to the variable called “word”.		**2 PS**
		Pascal: *=word[5]+word[6]+word[7] OR =concat(word[5],word[6],word[7])* *Java:* *=word.substring(4,7)* *Visual Basic:* *= right(word,3) OR =mid(word,5,3)* *TrueBasic:* *= word$(5:7)* ***1 mark** for use of substring operation, **1 mark** for correct selection of letters.*		

SECTION III – PART A – Artificial Intelligence

17 An "intelligent" computer system has been designed to compete against people on a televised quiz show. A human presenter reads out a question and the contestant quickest to respond gets to answer the question.

Some examples of the quiz questions are shown below:

Question	**Answer**
What word means a water sport and also browsing the web?	Surfing
What word meaning "also" sounds like a number?	Too
Which animal is known as "the ship of the desert"?	Camel

(a) (i) The computer system requires the ability to process *natural language*. State **two** other aspects of intelligence involved in playing this quiz game. **2 PS**

Problem solving, memory, learning, creativity, cognitive ability, other valid

***1 mark** for each of two valid.*

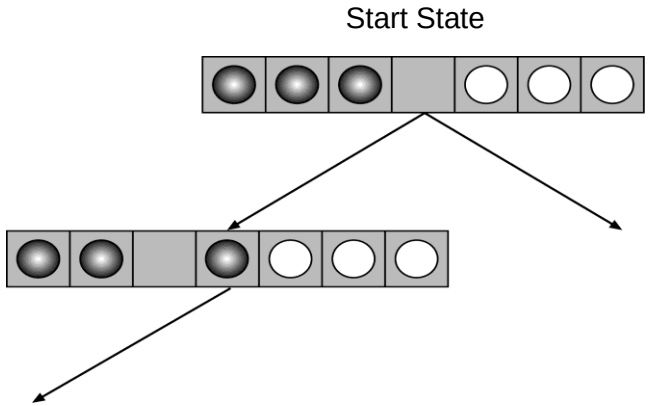
(ii) Explain why **this** computer system better justifies a claim of "artificial intelligence" than a chess system developed to play the world champion at chess. **2 PS**

- *Uses natural language (**1 mark**) which is a high order skill (**1 mark**)*
- *Uses a greater variety of human intelligence skills (**1 mark**) rather than manipulate a closed world of chess rules (**1 mark**)*
- *Requires the integration of human intelligence (in the same way that people do) (**1 mark**) instead of following of best path (**1 mark**)*
- *Uses judgement (**1 mark**) to decide levels of confidence for response (**1 mark**)*
- *Larger domain of knowledge required in quiz game (**1 mark**), Chess has a much narrower simplistic domain (**1 mark**)*
- *Any other valid (**1 mark**) with justification in context (**1 mark**)*

	(b)	The first stage of natural language processing is *speech recognition*.		
		(i)	Name and describe the **two** other stages of *natural language processing* that the computer system will use.	**4 KU**
			• *Natural Language Understanding NLU – checking it is a valid sentence, extracting meaning for the sentence/phrase, resolve ambiguity* • *Natural Language Generation NLG – formulating a suitable response to the sentence/question* • *Speech Synthesis – outputting the response in the form of sound/voice* ***1 mark** for name and **1 mark** for description (not merely expanding acronym).*	
		(ii)	Describe **one** difficulty in natural language processing using the quiz questions to illustrate your answer.	**2 PS**
			• "*ship of the desert" is a metaphor/ambiguous (**1 mark**) which could prove difficult because its literal sense is impossible (**1 mark**)* • *question/answer on 'surfing' is an example of changing nature of language (**1 mark**), ambiguity used within the question/ answer (**1 mark**)* *Note: correct "difficulty" which does not refer to scenario gain a maximum of 1 mark*	
	(c)	Speed of response is important when playing the game. Describe how **one** advance in hardware would improve response times.		**2 PS**
		Faster processors would execute searches of knowledge in less time. *Parallel processing:* • *would enable multiple responses to be evaluated simultaneously* • *to search possible responses to select the one to use* *Cache – would shorten the time for fetching and executing instructions to arrive at a response more quickly.* ***1 mark** for hardware advance, **1 mark** for how it would improve response times.*		

18	A Scottish law firm is involved in the development of an expert system that will be used on the World Wide Web. The purpose of the expert system is to create legal documents after an online consultation with a client.			
	(a)	**(i)**	Name and describe **two** components of an *expert system shell*.	**4 KU**
			*Inference engine (**1 mark**) – performs pattern matching/searching on the rules using information gathered (**1 mark**)* *User interface (**1 mark**) – gathers information from the user by presenting options/choices and provides output to user (**1 mark**)* *Note: No marks for Knowledge Base but award 1 mark for description of KB eg Contains facts and rules*	
		(ii)	The *expert system* will use *working memory* when consulting with a client. State **one** way in which information will be added to working memory during a consultation.	**1 PS**
			• *Asking the user questions (to add responses)* • *By firing/selecting/applying rules (and adding the conclusion)* ***1 mark** for each valid point.*	
	(b)	Once created the expert system will be rigorously tested.		
		(i)	Explain the importance of testing during the software development process.	**2 KU**
			*Determines if the software is fit for purpose (**1 mark**) by meeting the software specification (**1 mark**)* *Determines if the software is correct (**1 mark**) by giving the correct output for the specified input (**1 mark**)* *Determines if the software is robust (**1 mark**) by handling invalid input (**1 mark**)*	
		(ii)	State **two** reasons why it is important for the law firm to be involved in the testing of an expert system	**2 PS**
			• *Only the lawyers have the knowledge to know if the output is correct* • *Only the lawyers will understand the terminology of the output documents* • *Any other reasonable response* ***1 mark** for each of two valid responses.*	

	(c)	Explain why making this expert system available online might lead to difficulties for anyone using the system.	**2 PS**
		*Internet makes it available to users worldwide (**1 mark**) but laws vary from country to country or region to region (**1 mark**).*	
	(d)	Describe **one** situation where a lawyer is better at providing legal documents than an expert system.	**2 PS**
		*Laws can change (**1 mark**) requiring maintenance (**1 mark**).* *Novel situations (**1 mark**) for which there are no applicable rules (**1 mark**).* *No common sense (**1 mark**) so limited to application of existing facts/rules (**1 mark**)* *Expert system may be out of date (**1 mark**) Lawyer has more up-to-date knowledge (**1 mark**)* *Any other reasonable situation (**1 mark**) with description (**1 mark**).*	
	(e)	Name and describe another real world application of an expert system with which you are familiar.	**2 KU**
		Dendral — *identifying unknown organic molecules* *Mycin* — *identify bacteria causing severe infections* *Rice-Crop Doctor* — *diagnoses pests and diseases for rice crops* *AGREX/CALEX* — *areas of fertilizer application, crop protection, irrigation scheduling, and diagnosis of diseases* *Variex* — *advises selection of the best cultivators for different agricultural situations* *Weiping Jin Expert System* — *advice on crop management* *LEY Expert System* — *automated, remote, real-time weather data acquisition and reporting system* *CLIPS* — *to reach conclusions concerning profitable alfalfa production* *CaDet* — *decision support system for Early Cancer Detection* *DXplain* — *Medical diagnosis* *Puff* — *diagnoses the results of pulmonary function tests* *Seth* — *advice concerning the treatment and monitoring of drug poisoning* *PEIRS* — *(Pathology Expert Interpretative Reporting System) appends interpretative comments to chemical pathology reports* *R1 or XCON or XSEL* — *automatically selecting the computer system components based on the customer's requirements.* *There are **very** many other ES available in a variety of disciplines. Award **1 mark** for valid name and **1 mark** for reasonable description of field.*	

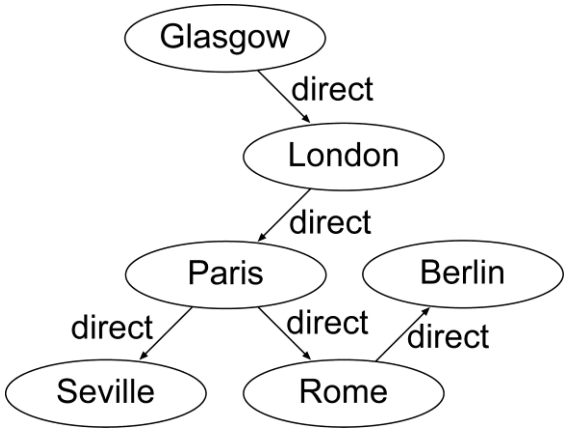
19	The “six stones” puzzle starts with three black counters and three white counters on a board with seven spaces as shown:  The puzzle is solved when the black and the white counters have swapped places. However, black counters can only move right and white counters can only move left according to the following four possible moves. 1. A black counter can move one space to the right into an empty space 2. A black counter can jump to the right over a white counter into an empty space 3. A white counter can move one space to the left into an empty space 4. A white counter can jump to the left over a black counter into an empty space		
	(a)	A search tree is shown with the first move already completed:  	

		(i)	Draw the node that would be generated next if *breadth-first* searching is used.	**1 PS**
			●●●○_○○ *OR bbbw_ww*	
		(ii)	Draw the node that would be generated next if *depth-first* searching is used.	**1 PS**
			●_●●○○○ *OR b_bbwww* ●●○●_○○ *OR bbwb_ww* ***1 mark** for either of the two possible solutions*	
		(iii)	Use the "six stones" puzzle to explain the term '*backtracking*' in depth-first searching.	**2 PS**
			• *A path ends, or is blocked, as there are no possible other moves/descendants – there are no more legal moves for the stones from this point* • *The algorithm moves back to the previously stored state/move/arrangement of stones* • *To evaluate another possible move/descendant – try to move a different stone* ***1 mark** for each of two valid points.*	
	(b)	State **two** advantages of breadth-first when compared to depth-first searching.		**2 KU**
		• *The first solution it finds is always the best solution.* • *Won't get stuck in a loop down one branch.* ***1 mark** for each point.*		
	(c)	State another method of searching large search trees.		**1 KU**
		*Heuristic (search) (**1 mark**)*		

20 A company offers flights to various destinations stated below.

> There are direct flights from Glasgow to London and from London to Paris. Direct flights from Paris go to Rome and Seville. There is also a direct flight from Rome to Berlin.

(a) Represent the information in the paragraph above using a *semantic net*. **3 PS**



1 mark *for* ***all*** *six nodes*
1 mark *for five correctly arrowed lines*
1 mark *for naming the same predicate on* ***all*** *arcs eg "direct", "to"*

The company creates a knowledge base to provide information on their flights.

1.	direct(glasgow london).	There is a direct flight from Glasgow to London.
2.	direct(London paris).	
3.	direct(paris rome).	
4.	direct(paris seville).	
5.	direct(rome berline).	
6.	fly_direct(P Q) IF direct(P Q).	You can fly directly from P to Q if there is direct flight from P to Q.
7.	one_stop(X Y) IF fly_direct(X Z) AND fly_direct(Z Y).	There is only one stop in the flight from X to Y if you can fly directly from X to Z and fly directly from Z to Y.

	(b)	Explain the term *sub-goal*.	**2 KU**
		*Part of a rule that is satisfied (**1 mark**) for the goal to be satisfied/met (**1 mark**)*	
	(c)	State the solutions to the query: ? direct(paris X)	**2 PS**
		X=rome, X=seville ***1 mark each** (do not penalise order). Do **not** allow capitals on the names of the cities.*	
	(d)	State the complex query that will determine which airport can fly to both Rome and Seville.	**2 PS**
		?direct(X, rome), direct(X, seville) *?fly_direct(X rome) AND fly_direct(X seville)* ***1 mark for each** correct expression of direct( ) with both arguments in correct order, max 2 marks.*	
	(e)	Use the line numbers to trace the solution to the following query as far as the **first** solution. ? one_stop(glasgow Y) In your answer you will be given credit for the correct use of the term *instantiation/instantiated*.	**7 PS**
		• *Match at 7 X instantiated to glasgow, sub_goal fly_direct(glasgow, Z).* • *Match at 6 P instantiated to glasgow, sub_goal direct(glasgow, Q)* • *Match at 1 Q instantiated to london OR Z instantiated to london* • *Second sub-goal of rule 7, fly_direct(london, Y)* • *Match at 6 P instantiated to london, sub_goal direct(london, Q)* • *Match at 2 Q instantiated to paris/Y instantiated to paris. Y=paris is output* ***1 mark** each bullet (focussing on point underlined), plus **1 mark** for correct use of instantiation.*	

SECTION III – PART B – Computer Networking

21	A holiday park has a website on the Internet.		
	(a)	Below is part of the home page for the holiday park.  The *HTML* code required to create this part of the home page is shown below. Identify the **tags** represented by **A**, **B** and **C**. *<A> <head> <B>Bailey's Holiday Park</B> </head> <C> Welcome to the World of Family Fun </C> </A>*	**3 PS**
		A – html *B – title* *C – body* ***1 mark** for each of the above.*	

	(b)	A software development company was appointed to create this website. State the **job title** of the person who should keep the project on track and within timescale and budget.		**1 KU**
		*Project Manager (**1 mark**)*		
	(c)	The holiday park has many activities on offer such as cycling or rock climbing. There are a limited number of spaces available for each activity. The website allows guests to book and pay for these activities online before going on holiday.		
		(i)	Describe **one** benefit to the customer of booking these activities online.	**2 PS**
			• *Can check availability of activities instantly (**1 mark**) so if not available, you can easily check another one (**1 mark**)* • *Less chance of "worker"/"human" error (**1 mark**) as you can check the final screen (**1 mark**)* • *Pay before going on holiday (**1 mark**) so you don't need as much money with you on holiday/reduces queuing when on holiday (**1 mark**)* • *Know in advance what activities you will be taking part in (**1 mark**) so can bring requirements with you (for example: swimming suit) (**1 mark**)* • *Can book 24/7 (**1 mark**) so are not confined to normal office hours/more chance to make booking (**1 mark**)* • *Can book from any location (**1 mark**) so no need to travel to location/take time out of holiday to make booking (**1 mark**)* • *Any other valid benefit (**1 mark**) with appropriate reasoning (**1 mark**)* ***2 marks** for any bullet.*	
		(ii)	The holiday park notices that the number of activities booked has increased. State **one** possible reason for this increase.	**1 PS**
			• *Customers may not think of the cost as " holiday money"* • *Some activities "look better" online* • *Good advertising* • *Customers have more time to book (24/7)* • *Any other valid answer* *Note: trivial answers like "more people use the Internet" no marks unless explicitly linked to "larger customer base"* ***1 mark** for any bullet.*	

		(iii)	Customers are worried about the security aspect of paying online for these activities. State **one** way that the holiday park could reassure customers that paying online is safe.	**1 PS**
			• *Use a secure protocol such as HTTPS* • *Encryption* • *Digital certificates* • *Use a secure 3rd party payment service* • *Any other valid answer* ***1 mark** for any bullet.*	
	(d)	The software development company has created some web pages using *WML* code so that they can be displayed in a *WAP* browser. *WML* code is more limited than *HTML* code. State **two** limitations of WML code when creating the web pages.		**2 PS**
		• *WML doesn't support many text formats* • *WML has problems with tables (due to their width)* • *Restricted graphic format/standard JPG/GIF/PNG web formats cannot be displayed without conversion (to WBMP format)* • *Any other valid answer* ***1 mark each** for any 2 bullets. Note: Do not accept "All tags must be closed" as this is a fact not a limitation.*		

22	A car sales company has many branches throughout the United Kingdom. Details of all cars for sale are accessible through their *intranet*.			
	(a)	A salesperson has to download a 200 Megabyte file which is stored on the central file server. The actual file downloads at a speed of 512 kilobits per second. Calculate the time taken in minutes for this file to be downloaded using this connection. Express your answer to one decimal place.		**2 PS**
		*200 * 8 * 1024 = 1,638,400 Kilobits (**1 mark**)* *1,638,400 Kilobits/512/60 = 53.3 minutes (**1 mark**)* ***2 marks** if 53.3 minutes given without working as correct method must be assumed.*		
	(b)	The *OSI* model is a set of protocols used within computer networks. State the **purpose** of the OSI model.		**1 KU**
		• *To standardise the transmission of data between computer systems on networks* • *To allow different computer systems to communicate and work together on a network* • *To show how different protocols work at different levels in a network OS/environment* ***1 mark** for any bullet.*		
	(c)	Two protocols used to transmit data are HTTP and TCP/IP.		
		(i)	Describe the role of the IP protocol when transmitting data over an intranet.	**2 KU**
			• *IP adds an address (header) to each packet* • *IP routes the packets around the network* ***1 mark** for each bullet.*	
		(ii)	Name **one** other protocol that could be used to transfer files across an intranet.	**1 KU**
			*File Transfer Protocol/FTP (**1 mark**)*	

	(d)	When sending data across a network, *packet switching* may be used. Describe how packet switching operates.		**3 KU**
		• *The message is divided into packets* • *Each individual packet can take a different path through the network* • *Packets are re-assembled at destination* ***1 mark** for each bullet.*		
	(e)	*A parity check* is carried out when transmitting data around a network.		
		(i)	Describe **one** situation where a parity check would fail to detect an error. Use an example to illustrate your answer.	**2 PS**
			• *Double errors cancel each other out so error would not be spotted (**1 mark**)* • *For example: when using even parity, 0001 001 with parity bit 0 is received as 1000 001 with parity bit 0, the parity check will not fail since the reversal of the 1st and 4th bits leaves the parity bit unchanged (**1 mark**)* *OR* • *Where sender and receiver are using different parities (**1 mark**)* • *For example: when using even parity; 0001 001 with parity bit 0 is received as 0000 001 with parity bit 0 which should indicate an error, but the receiver is using odd parity and therefore parity check would not fail (**1 mark**)* *Note: any appropriate example **must** include a binary number as above*	
		(ii)	Explain **one** way in which using a parity check decreases network performance.	**1 PS**
			• *(Time will be taken to) carry out the calculation of the parity bit* • *(Time will be taken to) send the extra parity bit* • *(Time will be taken to) perform the parity check* ***1 mark** for any one bullet.*	

23	Ti-Ket Web is a small ticket agency. Ti-Ket Web sells event tickets over the telephone or on the Internet.			
	(a)	**(i)**	"A rival company sends millions of simultaneous online requests to generate a ticket availability report for a particular concert. At this point the system is inaccessible to normal user requests." Name the type of server attack described above.	**1 PS**
			*Denial of Service Attack/DOS (**1 mark**)* *Note: Accept Types of DOS – Bandwidth Consumption/Resource Starvation*	
		(ii)	State **two** financial consequences of this attack on Ti-Ket Web.	**2 PS**
			• *Loss of business* • *Cost of employing experts to analyse the attack* • *Cost of placing preventative measures for future attacks* ***1 mark** each for any two bullets.*	
		(iii)	Describe **two** ways in which the use of a firewall could help to prevent Ti-Ket Web from further attacks.	**2 PS**
			• *IP address filtering/Filters out IP addresses/block selected IP addresses access to local area network* • *Prevents access to network from particular ports/monitor all communication ports* • *Inspects incoming packets for suspicious activity* ***1 mark** for each of two valid points.*	
	(b)	Ti-Ket Web has a local area network. This network has a *switch*. Explain **one** reason why Ti-Ket Web decided to add a switch rather than a *hub* to the local area network.		**2 PS**
		• *A switch reduces network traffic (**1 mark**) due to it directing the packet/data to a specific station (**1 mark**)* • *There are fewer collisions (**1 mark**) due to a switch allocating the whole bandwidth to each connected computer (**1 mark**)* ***2 marks** for each bullet.*		

	(c)	The IP addresses for some of the devices on the network are as follows: Computer 1 198.169.120.100 File Server 198.169.120.103 Computer 2 198.169.120.101 Router 198.169.120.104 Computer 3 198.169.120.102 Printer 198.169.120.105		
		(i)	State the *class* of IP address used within this network. Justify your answer.	**2 PS**
			Class C – ***1 mark*** • *The first octet is between <u>192</u> and <u>223</u>* • *The first three octets are fixed* ***1 mark** for any bullet.*	
		A new computer is added to the network. It is allocated the IP address **198.198.120.278**		
		(ii)	State **one** reason why the second octet is invalid.	**1 PS**
			*It is different to the original which <u>indicates a different network</u> (**1 mark for bullet**)*	
		(iii)	State **one** reason why the fourth octet is invalid.	**1 PS**
			*It is <u>greater than 255</u>/<u>Out of range</u> (**1 mark**)*	
	(d)	*Carrier Sense Multiple Access with Collision Detection* (CSMA/CD) is used on this network to control which node can transmit at any one time. State **two** ways in which CSMA/CD might increase transmission time.		**2 PS**
		• *If more than one transmission takes place there will be a collision and data will have to <u>wait a random amount of time</u> (**1 mark**)* • *If more than one transmission takes place there will be a collision and data will have to be <u>re-sent</u> (**1 mark**)* • *Before transmitting data time is taken to check if the line is free (**1 mark**)* ***1 mark** each for any 2 bullets.*		

24	Many families use the Internet to search for information and communicate using e-mail.			
	(a)	A *meta-search engine* can be used to find information on the World Wide Web.		
		(i)	Explain how a meta-search engine works.	**3 KU**
			• *A meta-search engine transmits/passes queries to several other search engines* • *and their databases are searched* • *and details summarised in a list* ***1 mark** for each bullet.*	
		(ii)	Name **one** method that a search engine could use to build its indexes.	**1 KU**
			*Spiders OR Meta-Tags (**1 mark**)* *Note: description is not acceptable*	
	(b)	State the purpose of SMTP.		**1 KU**
		*SMTP is used for <u>sending/transfer/transmit</u> e-mails (**1 mark**)* *Note: not "receive" as this is the purpose of POP/IMAP*		

	Social networking sites are used by many children to communicate with other people.  			
	(c)		State **two** reasons why some parents may be concerned about their children accessing such sites.	**2 PS**
			• *Lack of face to face communication/social skills* • *Health issues/lack of exercise* • *Safety issues/access to inappropriate people* • *Security issues/children giving out personal details* • *Access to inappropriate material* • *Any other appropriate answer* ***1 mark** each for any two bullets.*	

	(d)	**(i)**	A parent has set up a *walled garden*. Explain the term "walled garden".	**2 KU**
			*There is a list of acceptable websites (**1 mark**)* • *restricted view of the Internet* • *all other websites are blocked* ***1 mark** for any bullet.*	
		(ii)	His child uses the Internet for homework. State why the child may **not** be happy with the walled garden.	**1 PS**
			• *Number of websites that could be viewed is too limited.* • *Child can only access websites deemed suitable by the parent.* ***1 mark** for any bullet.*	
		(iii)	An alternative method that the parent could use is "Internet filtering software". Explain why this would be more suitable for the child.	**1 PS**
			*This filters out particular keywords/websites and allows access to all others (**1 mark**).*	

	(e)	Some people believe that access to the Internet leads to an *Information Rich* society.		
		(i)	Explain the term “Information Rich”.	**2 KU**
			*Access to a broad range of information (**1 mark**) and the skill to use it (**1 mark**).* *Note: Accept other valid wording of concept with explanation*	
		(ii)	State **two** benefits of being Information Rich.	**2 PS**
			Information Rich enables you to: • *Make informed decisions and choices* • *Inform individual and business research/projects/tasks* • *Facilitate individual educational progress* • *Improve individual leisure pursuits* • *Improve individual job prospects* • *Any other valid answer* ***1 mark** each for any two bullets*	

SECTION III PART C – Multimedia Technology

25	The logo for a new business has been drawn on paper and then scanned into a computer. The logo is shown below.			
	(a)	**(i)**	*CCDs* are used by both scanners and digital cameras when capturing an image. Explain how the CCD in a scanner differs from those in a digital camera.	**2 KU**
			• *Scanner uses single linear CCD(s)* • *Digital camera uses a CCD array/grid* ***1 mark** for each of these*	
		(ii)	The edges of the scanned logo appeared slightly jagged. *Anti-aliasing* was used to smooth the edges. Describe how anti-aliasing achieves this.	**2 KU**
			*Uses intermediate shades of colour (**1 mark**) in surrounding pixels (**1 mark**)*	
		(iii)	Explain how *resampling* might remove the jagged edges.	**2 PS**
			*Rescan the logo (**1 mark**) using a higher resolution than the original scan (**1 mark**).* *OR* *Software adds extra <u>smaller</u> pixels (**1 mark**) to blend in (**1 mark**).*	
	(b)	It is suggested that the logo may be stored as a vector graphic. Explain why this logo should be stored as a vector graphic rather than a bitmapped graphic.		**2 PS**
		• *Vector graphic is resolution independent (**1 mark**) and so will always be displayed to the best effect (**1 mark**)* • *Logo is few objects (**1 mark**) and so vector graphic will have a small file size (**1 mark**)*		

Scanned Logo

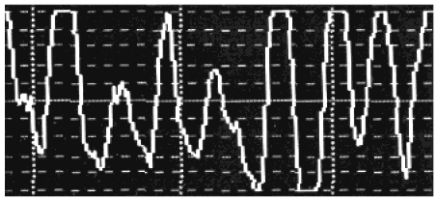
26	The members of the Metro Gnome Jazz Club have decided to create a club website. Members are allowed to download files; visitors can *stream* files.			
	(a)	**(i)**	Explain the term “stream”.	**1 KU**
			*Data being transferred and viewed before entire file has been received (**1 mark**)*	
		(ii)	Describe **one** advantage to the Jazz Club of only allowing visitors to stream files.	**2 PS**
			• *No permanent copy of file stored on visitor’s computer (**1 mark**)* • *So reduces opportunity for illegal copying (**1 mark**)*	
	Codecs play an important role during the streaming of files and can be implemented in hardware or software.			
	(b)	A codec codes and decodes streamed files. State **two** other purposes of a codec during the streaming of a file.		**2 PS**
		• *To decompress the streamed file* • *To decrease transfer time* ***1 mark** for each.*		
	(c)	Explain the benefit of having codecs implemented in hardware when receiving streamed multimedia files.		**2 PS**
		• *Hardware codecs use own GPU/processor rather than CPU* • *Coding/decoding will consequently be quicker* • *and so file can be played at correct rate* ***1 mark** for any two of these.*		

	The website includes a library of sound files stored in MIDI, WAV and MP3 formats.			
	(d)	Two of the attributes stored in MIDI files are *duration* and *tempo*. Name **one** other attribute stored in a MIDI file.		**1 KU**
		*Volume/Instrument/Pitch/Channel (**1 mark** for each of two valid attributes).* *Note: Do not accept: start of a note, end of a note, control messages, effects on a note (reverb and distortion, expression and portamento).*		
	(e)	State **one** type of sound for which MIDI is unsuitable.		**1 PS**
		*Voice or other recorded/sampled sound (**1 mark**)*		
	A particular piece of music is stored in MIDI and MP3 file formats. Both files are the same size.			
	(f)	**(i)**	Explain **one** advantage of storing files in MIDI rather than MP3 file format.	**1 PS**
			• *MIDI files are easy to manipulate* • *Individual attributes can be changed* ***1 mark** for any one valid point (Reference to file size is not acceptable)*	
		(ii)	A member downloads both versions of the file. Explain why the sound differs when each file is played back.	**2 PS**
			• *Sound card generates sound from MIDI file (**1 mark**) depends on capability of sound card/may not be same as original recording (**1 mark**).* • *MP3 is a bit mapped/sampled sound (**1 mark**) so the original sound is not reproduced (**1 mark**).* • *Valid fact (**1 mark**) with valid explanation (**1 mark**)* *Max **2 marks***	
		(iii)	State **two** ways that compression is achieved in the MP3 file format.	**2 KU**
			• *MP3 does not store sounds that humans cannot hear/emphasises sounds humans can hear best* • *MP3 does not store sounds that are drowned out by louder sounds* • *and then uses the Huffman compression technique.* ***1 mark** for each of two valid points.*	

27	David is a car racing fan. He records short video clips of races at a local circuit and transfers the clips to his computer for editing. David uses video editing software to join the video clips taken into one continuous video clip.			
	(a)	When he joins the clips together, David uses the *timeline* and *transition* features.		
		(i)	Explain why the timeline feature will be useful for David when he is producing the single continuous clip.	**1 KU**
			*Can plan the order of the clips/the effects to be applied (**1 mark**).*	
		(ii)	Name **one** transition David could use.	**1 KU**
			*Fade/Wipe/Dissolve/Hard cut/Peel/page turn/any other valid (**1 mark**)*	
	(b)	One of David's video clips plays for 4 minutes. David recorded the clip using 24 bit colour with a resolution of 720,000 pixels per frame at 15 frames per second. Calculate the file size of the uncompressed video. Show all working and express your answer in appropriate units.		**3 PS**
		*File size = (4 × 60 × 15) = 3600 frames (**1 mark**)* *= **3600** × (24 × 720000) bits (**1 mark**)* *= 62208000000 bits = 7776000000 bytes = 7.24 Gb (**1 mark**)*		
	(c)	David stores some video clips in the MPEG file format. Describe how MPEG achieves compression.		**3 PS**
		• *Key frames are stored (one every five/ten/etc)* • *Each frame is compressed (using lossy compression/JPEG is used)* • *Only changes between key frames are stored. (The data that stays the same in successive frames is removed)* ***1 mark** for each of these.*		

	(d)	David stores other video clips in the AVI file format. Unlike MPEG, AVI does not allow compression. State **two** reasons why the AVI format might still be a suitable file format for some video clips.	**2 PS**
		• *Frame size/resolution is limited (to a maximum of 320 × 240) but would be suitable for display in a small window* • *Frame rate is limited (to 30fps) but is acceptable for smooth display (above 25fps)* • *(File size is limited (to 2GB))* ***1 mark** for each of two valid points.*	
	(e)	David has old analogue video recordings that he is transferring onto his computer. Describe the roles of the ADC and DSP on the video capture card during the transfer.	**2 PS**
		• *ADC converts analogue data into digital data* • *DSP compresses/adds effects to digital data* ***1 mark** for each of these.*	

28	Super Tutorials create multimedia lessons.			
	(a)	All of the lessons begin with the Super Tutorial theme tune. The tune plays for 1 minute and was recorded in 32 bit stereo using a sampling frequency of 44.1 kilohertz. Ignoring compression, calculate the file size for the theme tune. Express your answer in appropriate units and show all working.		**3 PS**
		*File size = (60 × 44100) (**1 mark**) × 2 × 32 bits (**1 mark**)* *= 169344000 bits = 20.2 Mb (**1 mark**)*		
	The multimedia lessons include text, video and a voice track.			
	(b)	Lesson voice tracks are initially stored using the RAW file format. State the name of the **technique** used to convert the analogue signal into a digital form.		**1 KU**
		*PCM (Pulse Code Modulation) (**1 mark**)*		
	(c)	The completed lessons, which include video and voiceover sound files, are usually distributed in the RIFF file format.		
		(i)	The RIFF file format is an example of a *container file*. Explain the term “container file”.	**2 KU**
			*A container file allows the storage of a variety of data types (**1 mark**) as a single file (**1 mark**).*	
		(ii)	Explain the benefit of using container files in the distribution of multimedia files.	**2 PS**
			*All necessary files can be distributed as single item (**1 mark**) more likely that customer will receive all that is required for lesson (**1 mark**).* *RIFF is a common file format (**1 mark**) and accessible by different platforms (**1 mark**).*	

	(d)	During testing, some problems were found with the voice tracks. It was noted that some voice tracks were too loud but others were too quiet.			
		(i)	Name and describe the function of sound editing software which could be used to make the voice tracks play at the same volume.		**1 PS** **1 KU**
			*Normalisation (**1 mark**)* • *Increases or decreases the sound levels to an average value.* • *Causes sound levels to use the full dynamic range available.* ***1 mark** KU for description of normalisation.*		
		One voice track file also contained some unclear words. The waveform for part of this file shows the problem.			
		(ii)	State the term for this problem.		**1 KU**
			*Clipping (**1 mark**)*		
		(iii)	The problem may have been caused by recording at too high a volume setting. State **one** other possible reason for this problem.		**1 PS**
			• *Volume edited to beyond the dynamic range* • *A special effect may have been added.* ***1 mark** for either of these.*		

	(e)	Super Tutorials also supplies lessons on DVD. It has been suggested to Super Tutorials that *holographic* discs may replace DVDs in the future.		
		(i)	Describe how the physical storage of data on a holographic disc differs from a DVD.	**2 KU**
			• *DVDs have data on 1 or 2 sides of the disc (**1 mark**)* • *Holographic discs have the data stored through the thickness of the disc/in more than 2 layers (**1 mark**)*	
		(ii)	Holographic discs allow faster data transfer than DVDs. Explain **why** this is the case.	**2 PS**
			• *Holographic discs can be read in parallel (**1 mark**)* • *Whereas DVDs are read one layer at a time (**1 mark**)*	

[END OF MARKING INSTRUCTIONS]