2010 Computing

Higher

Finalised Marking Instructions

SECTION I

1	Convert this *8-bit two's complement* binary number into a decimal. 11010011	**1 PS**
	*-45 (**1 mark**)*	
2	Jane is concerned about a virus infecting her computer.	
	(a)	*Watching* is one *virus code action*. Describe the term "watching".	**2 KU**
		*The virus waits until a condition is met (**1 mark**)* • *before it triggers/is activated/performs its task* • *or example of condition eg Date reached, access to Internet* *(**1 mark**) for any one bullet.*	
	(b)	State **one** other virus code action.	**1 KU**
		• *Replication* • *Camouflage* • *Delivery* *(**1 mark**) for any one bullet.*	

3	A *register* can be used to store a *memory address*. State the **two** other types of item that can be stored in a register.	**2KU**
	• *An instruction (to be executed)* • *Data (to be processed)* *Ambiguous terms like number or value are not acceptable.* **1 mark** *for each bullet,* **max 2 marks.**	
4	A new printer has 640 megabytes of RAM installed. State **one** reason why the printer has RAM installed.	**1 KU**
	• *To store data that has been passed from the computer processor (while it waits for the printer to process it)* • *Acts as a buffer* • *Allows computer processor to carry on with other tasks* • *Any other suitable description* **1 mark** *for any of the above,* **max 1 mark.**	
5	Complete the **two** missing stages of the *fetch-execute cycle.* <table><tr><td>1</td><td>The memory address of the next instruction is placed on the address bus.</td></tr><tr><td>2</td><td></td></tr><tr><td>3</td><td>The instruction is transferred to the processor on the data bus.</td></tr><tr><td>4</td><td></td></tr></table>	**2 KU**
	2. Read line is activated OR Read signal is sent *4. Instruction is decoded and executed* **1 mark** *for each stage in the correct place,* **max 2 marks.**	

6			Greg buys a single copy of a popular computer game. He then makes several copies to give out to his friends.	
	(a)		State the name of the law that he has broken.	**1 PS**
			• *Copyright Designs and Patents Act (1 mark).*	
	(b)		State **one** reason why making copies of the game is illegal.	**1 PS**
			• *The files he shares are copyrighted* • *Not his files to share* • *He does not have permission to make the copies* • *He only has one licence* • *Financial loss to company as a result of reduced sales* • *Any other suitable reason.* *Do not accept trivial answers, for example, because it breaks the law.* *1 mark for any one bullet, max 1 mark.*	
7			Explain **one** difference between a *Local Area Network* (*LAN*) and a *Wide Area Network* (*WAN*) in terms of *transmission media*.	**2 KU**
			• *LAN will use dedicated (cable or wireless) media (1 mark) and a WAN will use telecommunication systems (1 mark)* • *LAN media owned by the organisation (1 mark), WAN owned by communication companies (1 mark)* • *LAN tends to be uniform in its type of connection/cable (1 mark), WAN tends to use more than one type of transmission medium (1 mark)* • *Any other valid difference (1 mark) with explanation (1 mark)* *Any of the above couplets, or other valid, to be awarded 1 mark for each branch of comparison.*	

8		Describe **one** reason for connecting a network using a *switch* rather than a *hub*.	**2 PS**

Each connected node on a switch receives full bandwidth	*Nodes on a hub share the bandwidth*
Data sent to single/addressed/required node with switch	*A hub broadcasts to all nodes*
Reduction/avoidance of collisions when using a switch	*Use of a hub increases network traffic*
Switch reduces network traffic	

- *Any other valid reference to switch (**1 mark**) with valid reference to hub (**1 mark**)*

1 mark *for reference to switch,* **1 mark** *for reference to hub,* **max 2 marks.**

9		Most high level languages have several *data types* available.	
	(a)	State what is meant by a *real* variable.	**1 KU**
		*A number with fractional part/floating point number/decimal number (**1 mark**).*	

	(b)	State the most suitable *data structure* and *data type* for storing the list called "valid" in the pseudocode shown below.
		
		For each member of list
		    If gender(current) = "M" or gender(current) = "F" Then
		       Set valid(current) to true
		    Else
		       Set valid(current) to false
		    End if
		End fixed loop
			2 PS

		*Array (**1 mark**) of boolean (**1 mark**).*	

10		*Design* is the second stage of the software development process.	
	(a)	Explain the importance of the design stage for one of the later stages in the software development process. Your answer should refer to the name of the stage that you have chosen.	**2 KU**
		• *Implementation (**1 mark**) − Program must be planned to show how program is to be coded (**1 mark**)* • *Testing (**1 mark**) – Used to create test data/To help identify errors (**1 mark**)* • *Evaluation (**1 mark**) − Design is used to ensure that all requirements in software specification are met (**1 mark**)* • *Documentation (**1 mark**) – Design is used as a template for the creation of the technical description of the code (**1 mark**)* • *Maintenance (**1 mark**) – Design will be looked at and changed to match the maintenance required (**1 mark**)* *Do not accept analysis or design.* **1 mark** *for valid stage and* **1 mark** *for valid reason.*	
	(b)	Describe how *stepwise refinement* can be used to help produce a detailed design.	**2 KU**
		• *Breaks problem into smaller problems* • *Continuing to break down sub problems* • *Until they can be solved easily/trivially/simply* **1 mark** *for each of two valid bullets,* **max 2 marks.**	
11		Documentation is produced at **each** stage of the software development process.	
	(a)	Name **one** item of documentation that is produced at the *implementation stage*.	**1 KU**
		• *(Structured) listing* • *Printout/hardcopy of program/source code* • *Source code* *Note: Program code is ambiguous.* **1 mark** *for any valid.*	

11	(b)	One purpose of creating documentation at **each** stage is to provide a starting point for the next stage. State **one** other purpose of documentation.	**1 KU**
		• *Provides a record of work done (required by project manager/client)* • *Aids maintenance (by keeping a record of changes made)* • *Track staff changes within the development team* • *Accept a purpose of a specific type of documentation, such as purpose of User Guide, Technical Guide, Internal Documentation* • *Any other valid purpose.* *1 mark for any valid point.*	
	(c)	Describe the role that the programmer might play in the production of the *technical guide* during the *documentation* stage.	**1 PS**
		To give advice on: • *how the parts of the program work* • *the memory/processor/system requirements/specifications* • *potential software/hardware clashes* • *the version/maintenance history* • *Other valid* *1 mark for any valid response.*	

12	Software can be evaluated in terms of *efficiency* and *portability*.		
	(a)	Software can be described as efficient if it does not waste memory. Describe **one** way of making software efficient in terms of **memory usage**.	**2 PS**
		• *If compiled version of program is used, (**1 mark**) meaning translator is not needed during execution (**1 mark**)* • *Use of local variables where possible (**1 mark**), allowing memory to be reused when it goes out of scope (**1 mark**)* • *Software is modular/has no unnecessary code/variables (**1 mark**) saving on memory used for duplicate/unnecessary code (**1 mark**)* • *Variable types should be appropriate for data (**1 mark**) for example using integer as opposed to real to save memory (**1 mark**)* • *Any other valid method and effect/reason* *1 mark for any valid method plus 1 mark for reason/effect, max of 2 marks.*	
	(b)	Describe what is meant by the term "portability".	**2 KU**
		*Software can run on any other platform/processor/"type of computer" (**1 mark**) OR other than the one it was designed for (**1 mark**) with little or no change (**1 mark**).*	
13	A sports centre has purchased software to assist with daily tasks such as bookings. The new software includes a *scripting language*. State **one** use of a scripting language.		**1 KU**
	• *Automate complex or frequently used task* • *Writing macros* • *Customising user interface* • *Increase/extend functionality* • *Any valid response* *Accept an example of a task, such as producing a report of the number of new members joined each week in the last month* *1 mark for any valid response.*		

SECTION II

14		Carolyn uses a computer to edit photographs that she has taken with her digital camera.	
	(a)	When Carolyn switches on her computer, system software in ROM finds and loads the operating system. Name this system software in ROM.	**1 KU**
		*Bootstrap loader (**1 mark**).*	
	(b)	Carolyn transfers the photographs from her camera to her computer using a *serial interface*.	
		(i) Two functions of the interface are *data format conversion* and *handling of status signals*. Describe how each of these functions would be involved in this data transfer.	**2 PS**
		Data format conversion – Converting the photograph data from serial to parallel or vice versa (as used in the computer system) *Handling of status signals – The camera will send signals to say it is ready to send data* *1 mark for each bullet, **max 2 marks**.*	
		(ii) State **two** other functions of an interface.	**2 KU**
		Voltage conversion *Protocol conversion* *Buffering/data storage* *Any other valid point* *1 mark for each of two valid points, **max 2 marks**.*	

14			Carolyn reduces the *bit-depth* of the photographs from 24 bits to 16 bits before saving the photographs onto the hard disk of her computer system.	
	(c)	**(i)**	Describe **one** advantage of reducing the bit-depth of the photographs from 24 to 16.	**2 PS**
			• *Reduce the file size* • *Fewer bits per pixel* • *Faster download* • *Smaller storage on disk/RAM* *Note: Storage space is insufficient, must mention disk or RAM* **1 mark** *for each bullet,* **max 2 marks.**	
		(ii)	Describe **one** disadvantage of reducing the bit-depth of the photographs from 24 to 16.	**2 PS**
			Fewer possible colours available (or any other valid) **(1 mark)**, *so poorer quality pictures* **(1 mark)**.	
		(iii)	A 4 inch by 6 inch photograph with a resolution of 600 dpi and using 16-bit colour depth is stored. Calculate the file size of the photograph. State your answer using appropriate units. Show all your working.	**3 PS**
			• *4 × 6 × 600 × 600 pixels* • *8640000 × 16 bits* • *(= 138240000) = 16.48 Mb* **1 mark** *for each bullet,* **max 3 marks.**	
	(d)		Two functions of the operating system are *memory management* and *input/output management*. Describe the roles of each of these **two** functions when a photograph is saved on to the hard drive.	**2 PS**
			• *Memory management − locates the file in main memory* • *Input/Output − controls the moving of (blocks of) data (between main memory and hard drive)* **1 mark** *for each bullet,* **max 2 marks.**	

14	(e)	Carolyn's camera uses *solid state storage*. Explain **one** reason why solid state storage is used in digital cameras.	2 PS
		• *Faster access times (**1 mark**) allows almost instant reviewing of pictures (**1 mark**)* • *Small and lightweight (**1 mark**) allowing small camera size (**1 mark**)* • *No moving parts (**1 mark**) so silent/robust (**1 mark**)* • *No moving parts (**1 mark**) so less battery power required (**1 mark**)* • *Less battery power (**1 mark**) so more pictures can be taken on 1 charge (**1 mark**)* ***1 mark** for fact plus **1 mark** for explanation, **max 2 marks**.*	
	(f)	Carolyn uses photo editing software that allows her to store a photograph using *JPEG* or *GIF* file format. Describe **one** difference between these two file formats.	2 KU
		• *JPEG is lossy (**1 mark**) whereas GIF is lossless (**1 mark**) − Simplistic answers such as JPEGs are lossy, GIFs are not –1 mark only* • *GIF only has 256 (8 bit) possible colours (**1 mark**), JPEG can have 16.7 million (24 bit) (**1 mark**)* • *JPEG requires less backing storage or memory than the equivalent GIF, (**1 mark**) hence is faster to transmit (**1 mark**)* • *GIFs can be animated (**1 mark**) whereas JPEGs are not (like any graphic format can only be used within animation) (**1 mark**)* • *GIFs allow transparency (**1 mark**) whereas JPEGs don't (because they are a single layer) (**1 mark**)* • *Other valid point* *Any other suitable comparison or fact with expansion, **max 2 marks**.*	

15		Ernie has bought a new computer with 24 *control lines*, a 32-bit *address bus* and a 64-bit *data bus*.	
	(a)	Calculate the **maximum possible** amount of memory that Ernie's computer can address. State your answer using appropriate units. Show all your working.	**3 PS**
		2^{32} possible locations *64 bits per location* *$2^{32} \times 64$ bits = 32Gbytes* *1 mark for each bullet, **max 3 marks.***	
	(b)	Ernie's computer has 16 megabytes of *cache* memory. Describe how the use of cache memory may improve system performance.	**2 KU**
		*Cache has faster access time than main memory (**1 mark**) speeding up fetching (**1 mark**)* *Holds frequently used instructions (**1 mark**) speeding fetching (**1 mark**)* *Wider internal bus (**1 mark**) speeding up data transfer (**1 mark**)* *Physically closer to processor (**1 mark**) speeding up transfer (**1 mark**)* *RAM in cache is made up from fast static RAM rather than slower dynamic RAM (**1 mark**) speeding access times (**1 mark**)* *Holds pre-fetched instructions in cache (**1 mark**) instead of accessing slower main memory (**1 mark**)* *You may accept two methods of improving system performance without justification.* *1 mark for each part of single bullet, **max 2 marks.***	
	(c)	Ernie requires new word processing software to use on his computer system. Describe **one** *compatibility issue* that should be considered when buying new software.	**2 KU**
		*Compatibility with the operating system (**1 mark**) to allow software to run/install (**1 mark**)* *Sufficient RAM/memory/Backing Storage/Processor (**1 mark**) to satisfy minimum program requirements/to enable it to run (**1 mark**)* *Any other valid point (**1 mark**) with justification (**1 mark**).*	

15	(d)		Two methods of measuring performance are *application based tests* and *MIPS*.	
		(i)	Explain why MIPS may be the better measure of **processor** performance than application based tests.	**2 PS**
			• *MIPS measures processor throughput (1 mark) and are independent of other computer components ie hard disk speed (1 mark)* • *ABTs depend on performance of other components (1 mark) and therefore may rate identical processors differently (1 mark)* • *MIPS measures processor throughput (1 mark) whereas ABTs measure the entire system (1 mark)* • *Other valid answer with explanation* *1 mark for each part of one bullet, max 2 marks.* *Note: expansion of MIPS is not sufficient for mark.*	
		(ii)	State **one** other measure of processor performance.	**1 KU**
			*FLOPS **OR** Clock Speed (1 mark).*	
			Ernie's computer is part of a small *peer-to-peer network* of computers in his family home. There are three other computers in the house.	
	(e)		Explain **one** reason why the family created a *peer-to-peer* network instead of a *client-server* network.	**2 PS**
			• *Each computer has its own backing storage (1 mark) and does not rely on central server (1 mark)* • *No complex server software to set up (1 mark) so easier to create shared area of peer-to-peer (1 mark)* • *Any other suitable reason* *Answers referring to additional costs of server, award 1 mark max as there is no need for an additional server in a home environment.* *1 mark for each part of one bullet, max 2 marks.*	

| 16 | Mrs Laird sets her Higher Computing class the task of writing a program that will take in three items – day, month and year. These three variables will have the same data type. The program will then output a "DateofBirth" variable with six characters, as shown below. | |

Input Variables			Output Variables
day	month	year	DateofBirth
15	Jun	1992	150692

| | (a) | State the only *data type* that the pupils can use for **all three** of the "day", "month" and "year" variables. Justify your answer. | **2 PS** |

String (1 mark)

- *"Jun" is textual and must be a string*
- *Number data types cannot accept text*
- *String operations to be carried out*

1 mark for any bullet point

| | (b) | Name the operation used to extract the last two characters from the contents of the "year" variable. | **1 PS** |

Substring (1 mark) Accept "string slicing"

| | (c) | Part of the program will take the contents of **month** eg "Jun" and turn this into the corresponding **two** character value for that month eg "06". Mrs Laird tells the pupils they must **not** use IF statements to implement this part of the program. Use pseudocode to design an algorithm for this part of the program. You should show only the first two months in your algorithm. | **3 PS** |

Case month of   1 mark Case/switch statement, 1 mark for two conditions, 1 mark for both text results.
   When "Jan"
      *Set month to "01"   Note: CASE or equivalent <u>must</u> be used as the question clearly states that "IF" is <u>**not**</u> to be used.*
   When "Feb"
      Set month to "02"

16	(d)	Name the operation used to join the three values together to produce the six characters for "DateofBirth".	1 KU
		*Concatenation (**1 mark**)*	
	(e)	The contents of the "DateofBirth" variable are to be held in memory in ASCII format. Calculate the minimum amount of memory required to store the contents of this variable.	2 PS
		*8 bits per character (**1 mark**)* *= 8 * 6 = 48 bits or 6 bytes (**1 mark**)*	
	(f)	The pupils are using a *procedural* language to write their programs.	
		(i)	State **two** features of procedural languages.	2 KU
			Follows a sequence of instructions/defined start and end point *Use of subprograms/functions* *Range of variable types* *Program control using repetition and selection structures* *Uses arithmetical and logical functions* *Any other valid point* *Simplistic answers like needs to be translated, use of arrays, variables are not acceptable at this level.* ***1 mark** for any valid, **max of 2 marks***	
		(ii)	State **one** feature of *event-driven* languages that is **not** commonly found in procedural languages.	1 KU
			Code activated/order of execution assigned to particular user action eg clicking on button *Routines/code for handling events* *Predefined routines for the creation of buttons/windows/forms/etc* *"No start and end point" without qualification insufficient on its own.* ***1 mark** for any one valid.*	

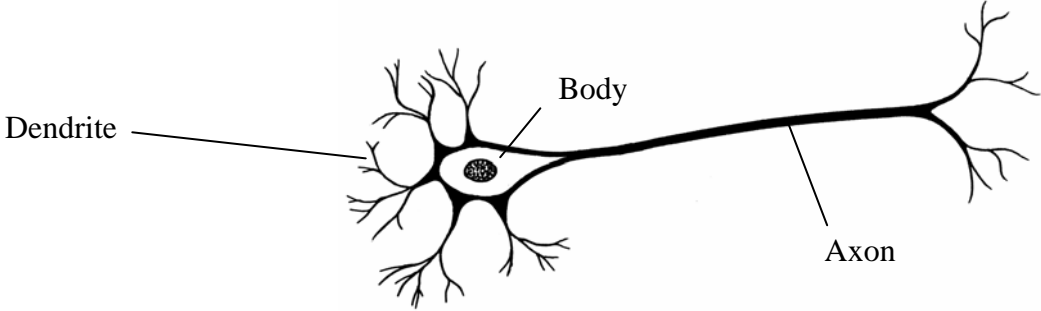| 16	(g)	Mrs Laird tells the pupils that their programs must be easily *maintainable*. Describe **two** characteristics of a program that makes it easily "maintainable".	**2 KU**
		• *Comment lines/internal documentation to describe code* • *Capitalise/highlight/embolden keywords to increase readability* • *Indentation/blank lines/white space to increase readability* • *Meaningful variable/subroutine/function names describes function of code* • *Modular code/use of procedures/functions* • *Use of parameter passing* • *Use of local variables* • *Any other valid* *1 mark for each of two valid points, **max of 2 marks*** *Note: "Readable code" on its own is insufficient.*	
	(h)	Mrs Laird also tells the pupils that they must avoid the use of *global variables* in their programs where possible.	
		(i) State the meaning of the term "global variable".	**1 KU**
		*A variable that can be used/accessed/updated anywhere in a program (**1 mark**).*	
		(ii) Explain why the pupils have been asked to avoid the unnecessary use of global variables when programming.	**2 KU**
		• *Unexpected changes to variables (**1 mark**) caused by variables with the same name interacting (**1 mark**)* • *Data flow is unclear (**1 mark**) which reduces readability (**1 mark**)* • *RAM assigned to local variables is reused (**1 mark**), so more efficient use of memory (**1 mark**)* • *Any other valid response with explanation* *1 mark for each part of any one bullet point, **max of 2 marks***	

17	Henry works for a company that maintains office buildings. He decides to write a program to print labels for the room keys in a new office block. The block has 38 floors, each with 25 rooms. The label will consist of the floor number and the room number. The design for the program is shown below alongside a sample section of output.	

For each of 38 floors
      For each of 25 rooms
            Display "Floor Number:" and floor_no
            Display "Room Number:" and room_no
      Next room
      Display two blank lines
Next floor

```
Floor Number: 12
Room Number: 3


Floor Number: 12
Room Number: 4
```

	(a)	Once the program has been written it must be translated. Describe clearly why using a *compiler* to translate the code produced from **this** algorithm would be more efficient in terms of **processor usage** than using an *interpreter* to translate the same code.	**2 PS**
		• *Interpreter will translate the contents of the loops every time they are carried out* • *Compiler will translate the contents of the loops once only* • *Saving processor time by reducing the number of translations* ***1 mark** for any two bullets. Accept other wording, but answer must relate to context for full marks.*	
	(b)	State **one** example of how text output from a program could be *formatted*.	**1 KU**
		Font, size, style, colour, columns/table/tab, alignment ***1 mark** for any valid response.*	
	(c)	The company decide to include Henry's code as a new function in their building management software. State the **type** of maintenance being carried out on the building management software by adding this section of code as a subprogram.	**1 PS**
		*Perfective (**1 mark**).*	

17	(d)		In order for Henry's program to operate correctly for **any** office building **two** parameters would have to be passed to it.	
		(i)	State what these **two** parameters would be.	**2 PS**
			• *Number of floors in the building (**1 mark**)* • *Number of rooms on each floor (**1 mark**)* *Accept possible <u>names</u> of parameters, such as floors or no_of_rooms etc but NOT floor_no or room_no*	
		(ii)	State whether these parameters would be passed to the subprogram by *value* or by *reference*. Justify your answer.	**2 PS**
			• *Passed by value (**1 mark**)* • *The subprogram only needs to use these values, it should not change them (**1 mark**)*	
	(e)		Another subprogram in the building management software is used to find the range of temperatures in a building in one day. The temperature is recorded every 15 minutes within a 24 hour period and stored in a list. Use pseudocode to design **one** algorithm to find **both** the **highest** and **lowest** temperatures in this list.	**5 PS**

			Set min to first temp in array ***1 mark*** *for initialising <u>both</u> min and max to suitable values*
			Set max to first temp in array
			
			For each temp() ***1 mark*** *loop with termination*
			    If temp(current)>max then
			        Set max to temp(current) ***1 mark*** *for if...endif with correct max condition*
			                                       1 mark *for if...endif with correct min condition*
			
			    If temp(current)<min then ***1 mark*** *for assignment to <u>both</u> min and max*
			        Set min to temp(current)
			    End If *Note: nested Ifs may be used*
			Next temp() *Note: if max and min algorithms are written separately award full marks*
			                                 Note: End If can only be omitted where indentation is unambiguous where if/loop ends	

			SECTION III PART A – Artificial Intelligence	

18			Game playing is one area of research in *artificial intelligence*. Computers are being used in games such as chess and card games.	
	(a)	**(i)**	State **one** meaning of the term "artificial intelligence".	**1 KU**
			• *Machines/computers/programs capable of doing task that would require intelligence if done by human* • *Ability of computer to show intelligent behaviour* • *Any other valid point* *1 mark for any one valid point.*	
		(ii)	Name **one** popular test used to determine whether a computer system can be described as having artificial intelligence or not.	**1 KU**
			*Turing test (**1 mark**).*	
		(iii)	Explain why training computer systems to play simple games is thought to be a good way of investigating artificial intelligence.	**2 PS**
			• *A human requires intelligence to play the game (**1 mark**) so the computer is intelligent if it can play/beat the human (**1 mark**)* • *Games have a restricted rule set and a clear goal (**1 mark**) so they are easier to program (**1 mark**)* • *Games are able to be expressed as logical rules (**1 mark**) so can be coded easily (**1 mark**)* • *Any other valid fact (**1 mark**) with explanation (**1 mark**)* *Max 2 marks.*	
	(b)	**(i)**	One aspect of intelligence is *cognitive ability*. State **two** other aspects of intelligence that are used in game playing.	**2 KU**
			• *Learning* • *Problem solving skills* • *Remember facts/experiences* • *Language* • *Creativity* *1 mark per valid bullet, **max 2 marks**.*	

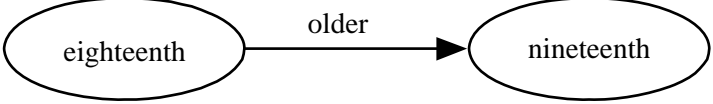| 18	(b)	(ii)	Describe how **each** of your answers in part (i) may be used in game playing.	**2 PS**
			• *Learning new strategies that can be applied in future games* • *Problem solving to search for appropriate strategy for different situations that occur* • *Remembering previous experience to inform future strategy* • *Interpreting of typed or spoken commands to perform actions* • *The idea of coping with new situations and/or novel solutions* *1 mark per valid bullet matching the answer to part (i),* **max 2 marks.**	
	(c)		*Parallel processing* and *increased memory* have improved the performance of computers in game playing.	
		(i)	Describe how parallel processing can improve performance in games such as chess.	**2 PS**
			• *Different processors evaluate different paths/moves (**1 mark**) simultaneously (**1 mark**)* • *Several possible moves explored independently (**1 mark**) at same time (**1 mark**)* **Max 2 marks.**	
		(ii)	Describe how increased memory can improve performance in games such as chess.	**2 PS**
			• *With more states held in memory (**1 mark**), response time should be faster (**1 mark**)* • *A larger amount of game data/states can be stored (**1 mark**) improving experience and decision making (**1 mark**)* • *Allowing more moves to be stored (**1 mark**) more complex games can be played (**1 mark**)* • *Valid point (**1 mark**) leading to improved performance (**1 mark**)* *1 mark for each part of bullet,* **max two marks** *Note: Performance may be interpreted as processor/gameplay/skill level.*	

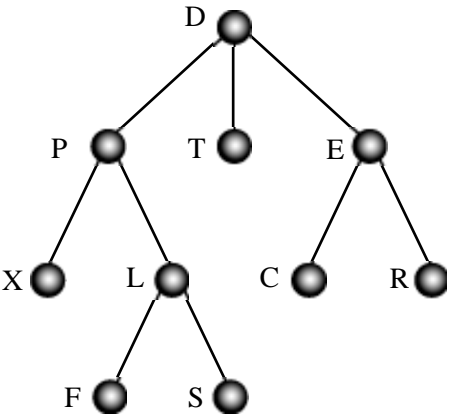| 19	An area of artificial intelligence attempts to model systems based on the human brain. A diagram of a neuron found in the human brain is shown below:	
(a)	Describe **one** similarity between an *artificial neuron* and a human neuron.	**1 KU**
	• *Both systems take a number of inputs* • *The strengths of the inputs are totalled* • *Both systems use weightings (to boost or inhibit signals)* • *If the total value of inputs in each system is greater than a threshold value the neuron fires* *1 mark for any one valid bullet.*	
(b)	State **two** changes that can take place within an *artificial neural system* during the learning (or training) process.	**2 KU**
	• *Alter weights* • *Alter threshold values* *1 mark per bullet, **max two marks.***	

19	(c)		In order to develop an artificial neural system a *restricted domain* should be identified.	
		(i)	Explain what is meant by the term "restricted domain".	**1 KU**
			*Containing knowledge about a specialised/narrow area eg character recognition, weather forecasting (**1 mark**).*	
		(ii)	State **one** other characteristic of a domain suitable for implementing as an artificial neural system.	**1 PS**
			• *Large known data set or large set of examples for which the output can be given* • *Finite set of characteristics for inputs* • *Numerical values for inputs or conversion to numerical eg female=1, male=2* ***1 mark** for any valid bullet.*	
	(d)		The artificial neural system can be *hard-wired* or implemented as a *software model*. State **one** advantage of implementing an artificial neural system as a software model instead of being hard-wired.	**2 PS**
			• *Software model is more easily programmed/reprogrammed/adapted/updated (**1 mark**) hard-wired solutions must be rebuilt (**1 mark**)* • *Software model is easily duplicated for testing/training/distribution (**1 mark**) each hard-wired unit must be built (**1 mark**)* • *Any other valid comparison showing advantage of software model* ***1 mark** for any valid advantage of software, **1 mark** for the converse in hard-wired solution, **max 2 marks**.*	

20			A company has developed a computer vision system to monitor swimmer safety in outdoor swimming pools. The system monitors activity in the pool using a number of cameras and will alert lifeguards to potential problems.	
	(a)		*Computer vision* consists of a number of stages.	
		(i)	Name and describe the **first** stage of computer vision.	**2 KU**
			• *Image acquisition (1 mark)* • *Capturing the (digitised) image (1 mark)*	
		(ii)	*Edge detection* will be used to analyse the image. Explain **one** problem for edge detection in **this** situation.	**2 PS**
			• *Overlapping people will confuse the outlines (1 mark) making outlines (of individual swimmers) difficult to detect (1 mark)* • *Shadows being cast/reflections (1 mark) which will create false edges (1 mark)* • *Waves/ripples/distortions in the water will distort the outlines (1 mark) making false edges (1 mark)* • *Any valid problem (1 mark) with explanation (1 mark)* *Max two marks.*	
	(b)		The cameras capture still images using **65536** colours. Calculate the *bit depth* of the images captured.	**1 PS**
			16 bits or 2 bytes (1 mark).	

21	A student has created software about extinct animals for a museum. The software has a *knowledge base* with information about animals and the century in which they became extinct.	
	1 extinct(dodo seventeenth) — *The dodo became extinct in the seventeenth century.* 2 extinct(sea_cow eighteenth) 3 extinct(atlas_bear nineteenth) 4 extinct(rice_rat twentieth) 5 extinct(eastern_elk nineteenth) 6 older(seventeenth eighteenth) — *The seventeenth century is older than the eighteenth century.* 7 older(eighteenth nineteenth) 8 older(nineteenth twentieth) 9 earlier(A B) IF older(A B) — *Century A is earlier than century B if century A is older than century B.* 10 earlier(A B) IF older(A C) AND earlier(C B) — *Century A is earlier than century B if century A is older than century C and century C is earlier than century B.* 11 extinct_earlier(X Y) IF extinct(X A) AND extinct(Y B) AND earlier(A B) — *Animal X became extinct earlier than animal Y if animal X became extinct in century A and animal Y became extinct in century B and century A is an earlier century than B.*	

	(a)	State the solutions to the following query: ? extinct(X nineteenth)	**2 PS**
		• *X=atlas_bear* • *X=eastern_elk* *1 mark per bullet* *Note: solutions must have "X"= (Do not penalise for order).*	

21	(b)	When testing the knowledge base the student entered a query to identify the centuries that came before the twentieth century. The solutions to the query were: A = nineteenth A = eighteenth A = seventeenth State the query that the student entered that resulted in this output.	**3 PS**
		earlier(A twentieth) **1 mark** *for "earlier" predicate,* **1 mark** *for* <u>*both*</u> *arguments (A, twentieth),* **1 mark** *for correct order.*	
	(c)	Trace the **first** solution to the query: ? extinct_earlier(X sea_cow) In your answer you will be given credit for the correct use of the term *sub-goal*.	**6 PS**
		• *Match at 11, Y is instantiated to sea_cow,* <u>*subgoal is extinct(X, A)*</u> • *Match at 1, X is instantiated to dodo and A instantiated to seventeenth,* <u>*second sub-goal extinct(sea_cow,B)*</u> • *Match at 2, B instantiated to eighteenth,* <u>*subgoal earlier(seventeenth, eighteenth)*</u> • *Match at 9,* <u>*subgoal older(seventeenth,eighteenth)*</u> • *Match at 6, all subgoals met,* <u>*output X=dodo*</u> **1 mark** *for each bullet point.* **Award 1 additional mark** *for a single correct use of term sub-goal anywhere in the explanation,* **max 6.**	
	(d)	*Negation* is implemented in Prolog by the use of *NOT*. Describe the effect of *NOT* in the evaluation of a query.	**1 KU**
		Flips/toggles/reverses output (from true to false or vice versa) (**1 mark**). *Note: Accept an example ie NOT(older(X Y)) is equivalent to older(Y X).*	

21	(e)		The knowledge base could have been represented using a *semantic net*.	
		(i)	Draw a simple semantic net of the fact at **line 7**	**2 PS**
			Correct diagram with two nodes "nineteenth" and "eighteenth" (1 mark) *with arrow labelled "older" going correct direction (1 mark)*	
		(ii)	Use your diagram to explain how a semantic net is used to represent knowledge.	**2KU**
			• *Relationships are identified (using arrowed lines)* • *Objects are represented by nodes* *1 mark per bullet point, **max two marks***	
	(f)		The student chose to implement the software using a *declarative* language rather than a *procedural* language. One reason for this choice was the facility to use *facts* and *rules*. State **one** other reason for choosing a declarative language.	**1 PS**
			• *In-built searching/pattern matching/inference engine* • *Goal directed searches using queries* • *Use of recursion* • *No algorithm to be programmed* • *Any other acceptable* *1 mark for valid bullet point.* *Note: "no definite start/end point is not a reason for choosing declarative."*	

22	A *search tree* is shown below. The *goal state* is represented by the node C.	

Depth-first and *breadth-first* are search techniques that may be used to find the goal state.

	(a)	State the order in which nodes would be visited using **depth-first**, stopping when the goal state is reached.	**1 PS**
		DPXLFSTEC (allow DPXPLFLSLPDTDEC) (1 mark)	
		Note: <u>zero</u> marks if candidate goes beyond goal state.	
	(b) **(i)**	State **one** advantage of using **depth-first** when compared to breadth-first to search the tree.	**1 PS**
		• *Uses less memory/memory efficient (as it only stores the current path)* • *May find 'lucky' solution on left branch* *1 mark for a valid bullet point.*	
	(ii)	State **one** advantage of using **breadth-first** when compared to depth-first to search the tree.	**1 PS**
		The first solution it finds is always the optimal/best solution/shortest path (1 mark).	

22	(c)	(i)	State which one of these two search techniques makes use of *backtracking*.	1 KU
			Depth-first (1 mark).	
		(ii)	Explain how the search technique named in part (c) (i) employs backtracking when searching the tree shown above.	2 PS
			• *When a node has no further descendents (X, F, S, T, etc) it is abandoned (removed from memory)* • *The search goes back to the previous node evaluated to identify another possible descendant* *1 mark per bullet point, max two marks*	
	(d)		The most *efficient* search would visit the nodes in the order **DEC**. This would use a *heuristic search*. Describe how a heuristic search finds the nodes in the path **DEC**.	3 KU
			• *Calculates/evaluates all the descendant nodes/possible next moves (from node D)* • *Selects the most promising (using an evaluation function/score)* • *Moves to that node/makes that move and repeats the process until goal is found* *Note: "use rule of thumb" is insufficient.* *1 mark per bullet point, max three marks.*	

SECTION III PART B – Computing Networking

23		The manager of the Sea Bay Hotel has created a website to display details of the hotel and allow customers to make online bookings. She hopes that this will cut down on the number of errors in bookings, such as double-booking and employees entering the wrong details for bookings.	
	(a)	The web address for the Sea Bay Hotel is: www.seabayhotel.co.uk A user enters this web address into a browser. Describe how the *domain name server* uses the web address to access the website.	**3 KU**
		The domain name server will: • *Look up Domain Name/URL/Web Address in its database/file/list* • *Perform domain name resolution/find its <u>IP address</u>/translate URL into <u>IP address</u>* • *Return <u>IP address</u> to user's machine/browser OR route connection for communication* *1 mark for each bullet point, **max three.***	
	(b)	Online hotel booking systems may be subject to additional problems such as hacking and credit card fraud. Name and describe **one** other possible illegal activity that the hotel could suffer from as a result of allowing customers to book and pay online.	**2 PS**
		• *Denial of service attack (**1 mark**) jamming the website with bogus queries OR bandwidth consumption/resource starvation (**1 mark**)* • *Phishing (**1 mark**) criminals setting up a clone of the site to gather card details (**1 mark**)* • *Any other valid responses (**1 mark**) with description (**1 mark**)* ***Max two marks*** *Note: Answers such as incorrect booking/wrong dates/hacking/credit card fraud etc are covered in the stem.*	

23	(c)	The hotel uses an intranet with ten computers, two printers and a scanner connected to it. State the most suitable class of *IP address* for this network. Justify your answer.	2 PS
		Class C (1 mark) • *No more than 254 addresses can be assigned (the hotel does not need this many)* • *Class C would waste fewer IP addresses* • *Other classes have too many IP addresses* *1 mark for any of the above.*	
	(d)	The manager is concerned about employees accessing unsuitable websites from the hotel's computers.	
		(i) Describe how *Internet filtering software* would prevent employees from accessing unsuitable websites.	1 KU
		• *Websites/URLs that are not allowed to be accessed are listed in the software* • *Websites containing keywords can be blocked* *1 mark for any one of the above.*	
		(ii) Describe how a *walled garden* would prevent employees from accessing unsuitable websites.	2 KU
		• *Selected websites/URLs are approved and listed in the software* • *Only websites on the approved list can be viewed* *1 mark for each bullet point.*	

23	(e)	Despite these precautions, the manager suspects that an employee is accessing websites containing illegal material. State **two software** actions that the *Regulation of Investigatory Powers Act* would allow the police to undertake.	**2 PS**
		• *Checking Internet history* • *Intercept communications/e-mail/Internet phone* • *Acquire communications data* • *Access decryption keys/encrypted data* *1 mark each for any two bullet points.*	
	(f)	The Sea Bay Hotel website can be found by using a *search engine*. A search engine can use either a *spider* or a *meta-search*. Describe how **each** of these two methods is used by a search engine.	**2 KU**
		Spider – travels from one link to another on the web, gathering indexing information *Meta-search – transmits/passes queries to several other search engines and their databases are searched and details summarised* *1 mark for each correct description.*	
	(g)	Some of the *HTML* coding for the hotel website is shown below: <html> <head> <title><i>Sea Bay Hotel Home Page</i></title> <body> <center> Sea Bay Hotel </center> Welcome to the Sea Bay Hotel </body> </htm> Identify **two** errors that are present in the above HTML code.	**2 PS**
		• *Cannot format the title tag* • *No close of head* • *Closing </html> is missing its "l"* *Any two from above, 1 mark each.*	

23	(h)	Describe **two** changes that could be made to the HTML code of the webpage to increase the number of hits by a search engine, once the above errors have been corrected.	**2 PS**
		• *A <u>meta tag</u> should be included (in the head section)* • *Relevant keywords added to (meta) tag* • *Any other valid* *1 mark for each valid point, **max 2 marks**.*	
	(i)	The manager is worried about *viruses*. *Anti-virus software* has been installed on all of the hotel computers. Name and describe **one** class of virus that the anti-virus software might detect.	**2 KU**
		• *File virus (**1 mark**)* *Attaches to the code of a program. It is run when the program is executed (**1 mark**)* • *Boot Sector Virus (**1 mark**)* *Infects startup files/boot files of the OS and is executed at startup time (**1 mark**)* • *Macro Virus (**1 mark**)* *A virus is a macro attached to a document and runs when the document is opened (**1 mark**)* *(It often copies itself to the macro library as a step towards copying itself to other files)* *1 mark for 1 name, **1 mark** for description.*	

24	Legends is a catering company that owns 130 restaurants nationwide. Each restaurant is connected to the head office through a Wide Area Network (WAN) to allow communication and file sharing.			
	(a)	The network uses *CSMA/CD*.		
		(i)	Describe how CSMA/CD operates.	**4 KU**
			• *Node checks to see if data transfer is taking place* • *If no transfer is taking place, data is transmitted* • *If two nodes attempt to transmit at same time OR if a collision is detected* • *Each node waits a random amount of time before attempting to re-transmit* *1 mark for each bullet point.*	
		(ii)	State **one** way in which CSMA/CD **reduces** network performance.	**1 PS**
			Time is taken to: • *Check if line is free* • *Wait a random amount of time (before re-transmitting if there was a collision)* • *Increased time/traffic due to re-transmitting data* *1 mark for any of the above.*	
	(b)	The TCP/IP protocol uses *packet switching* when transmitting files over the network. Explain **one** advantage of packet switching over *circuit switching* when transmitting files over a network.		**2 PS**
		• *Packet switching allows the network hardware to decide on the most efficient/least congested/fastest/cheapest route to take* • *Circuit switching establishes a line and uses this throughout* *OR* • *Each packet can take a different route when the network is busy/congested* • *Circuit switching establishes one line and uses this throughout, (even if it is busy)* *OR* • *Each packet can take a different route so if data is intercepted it will not be the whole file* • *With circuit switching the whole file can be intercepted* *1 mark for each point in the pair, max 2.*		

25			Bishopsland High School has its computers connected in a Local Area Network (LAN). The network is connected using cables.	
	(a)		The network conforms to the *Open Systems Interconnection* (OSI) model. Two layers of the OSI model are the *Session layer* and the *Network layer*.	
		(i)	State **one** task carried out at the Session layer.	**1 KU**
			• *Synchronises the exchange of data* • *Defines how connections can be established/maintained/terminated* • *Performs name resolution functions turning text names for web pages into IP addresses* • *Manages log-on and password authentication* *1 mark for any valid bullet point.*	
		(ii)	Name a networking device that operates at the Network layer.	**1 KU**
			*Router (**1 mark**).*	
	(b)		Data can be sent over a network using *synchronous* or *asynchronous* data transmission. Explain **one** advantage of synchronous compared with asynchronous data transmission.	**2 PS**
			• *The data transfer rate is quicker as a start and stop frame is only needed for each packet with synchronous* • *whereas a start and stop bit is needed for each byte with asynchronous transmission* *OR* • *It is much more efficient because it groups characters together into packets* • *rather than sending individual bytes one at a time* *Note: If the candidate gives the essential point (start/stop or group/byte) then award 1 mark* *1 mark for each point in the pair, **max 2.***	

25	(c)		A 200 megabyte file is to be downloaded at 100 megabits per second. Calculate how many seconds it will take to download the file. Show all working.	**2 PS**
			*(200 * 8)/100 = 16 seconds* *1 mark for 200 * 8 and 1 mark for divide by 100.*	
			A pupil has suggested that a wireless network would be better than the current cable network.	
	(d)	(i)	Name a **hardware** device that must be present in a computer to enable it to connect to a wireless network.	**1 PS**
			Wireless network interface card/Wireless NIC (1 mark) *Note: Do not accept "wireless dongle".*	
		(ii)	Explain the function of this device.	**1 KU**
			• *A wireless NIC sends and receive signals to and from a wireless router/access point* • *Holds a MAC code/address (which identifies a computer on a network)* • *Accept functions of a network interface card, for example: Packaging data into frames, Data Conversion, Buffering, Auto-sensing* *1 mark for any bullet point.*	
	(e)		State **two** disadvantages of converting to a wireless network compared to using cables.	**2 PS**
			• *Slower transmission rates* • *More subject to interference* • *Range (Distance) is restricted* • *Less secure if not set up properly* • *Any other valid response* *1 mark each for any two bullet points.*	

25	(f)	The school network has been subject to a *denial of service* attack. Describe **one** method of using software to carry out a denial of service attack.	**1 KU**
		Description of resource starvation *Description of bandwidth consumption* *Taking advantage of bugs in networking software/exploit network management flaws* *Description of attacking the routers (Note: use "ping of death" is insufficient)* *Description of domain name server (DNS) attacks* *Any other valid response* *1 mark* for any one bullet point.	
	(g)	The school is situated in a remote area that was previously considered *Information Poor*.	
		(i) Describe **one** way that the pupils may now be *Information Rich*.	**1 PS**
		Greater communication with other people via e-mail/social networking sites *Access to more information via Internet (not just "Access to the Internet")* *Freedom of speech via on-line forums* *Other valid response* *1 mark* for any one bullet point.	
		(ii) Explain **one** social implication of the change to Information Rich.	**1 PS**
		Broader horizons/access to different cultures enriches own culture *Gives greater access to formal and informal education* *Lack of (face-to-face) social skills* *Greater political awareness and socio-political mobility* *Other valid implication* *1 mark* for implication. *Note: Access to cheaper goods is not a social implication.*	

26		When data is transmitted across a network, it is important that error checking takes place. A *parity check* and a *cyclic redundancy check* are two methods of error checking.	
	(a)	Explain why a cyclic redundancy check is more effective than a parity check.	**2 PS**
		• *Parity check will not pick up if two bits are flipped (**1 mark**), a cyclic redundancy check can detect this type of error (**1 mark**)* • *Even parity will not pick up a break in the signal (**1 mark**), CRC would detect a badly formed packet (**1 mark**)* • *CRC uses a <u>pre-defined calculation</u> (agreed by each device) (**1 mark**), Parity may differ between two machines (and cause problems) (**1 mark**)* • *Any other valid comparison* *__1 mark__ for each point in the pair, **max 2.***	
	(b)	*Error checking* improves the **integrity** of data passing through the network. Explain **one** way that error checking may **reduce** the performance of the network.	**2 PS**
		• *Increased transfer time* • *Calculations carried out at each end of transmission* • *Extra data is sent eg checksum/parity* *__1 mark__ for any two valid bullets points.*	
	(c)	The network must be able to avoid catastrophic failure. Describe **two** software *disaster avoidance* techniques that could be used to make the network less prone to failure.	**2 PS**
		• *Use of anti-virus software* • *Use a firewall* • *Disk monitoring for possible malfunctions/Run regular diagnostic tests* • *Any other valid <u>software</u> technique* *__1 mark__ each of two valid bullet points.* *Note: no marks for backup.*	

26	(d)		If the disaster **avoidance** techniques fail, the network may crash. A *backup server* and *mirror disks* are both *backup strategies* that could be used to **recover** from this disaster.	
		(i)	Describe **one** benefit and **one** drawback of using a backup server as a disaster recovery strategy.	**2 PS**
			Benefit • *Makes a full backup of the network server* • *Makes a copy of the configuration, software and files of the network server* • *Any other valid point* *Drawback* • *Must be kept up to date* • *Backup causes a network overhead* • *Any other valid point* *Note: purchasing cost not relevant to recovering from a disaster.* **1 mark** *for one bullet from Benefit and* **1 mark** *for one bullet from Drawback.*	
		(ii)	Describe **one** benefit and **one** drawback of using a mirror disk as a disaster recovery strategy.	**2 PS**
			Benefit • *Copies are always up-to-date* • *Recovery time is very small because you just switch to the second disc* • *Any other valid point* *Drawback* • *Does not copy network configuration or software* • *Any other valid point* *Note: A mirror disk involves writing data to two discs at the same time.* *Note: purchasing cost not relevant to recovering from a disaster.* **1 mark** *for one bullet from Benefit and* **1 mark** *for one bullet from Drawback.*	

SECTION III PART C – Multimedia Technology

27		Two photographs are to be used as the basis for an animation. A digital camera is used to take the photographs.	
	(a)	Describe in detail how an image is captured and converted into a digital format by the camera.	**3 KU**
		• *Light focused onto array of <u>CCDs</u> (charge-coupled devices)* • *Analogue signal sent (from CCDs) to ADC* • *(ADC) converts analogue into digital* *1 mark for each bullet, max 3.*	
	(b)	Each frame in the completed 12 second animation is held as a GIF with a resolution of 640×480 pixels. The animation has a frame rate of 24 frames per second. Calculate the file size of the animation before compression. State your answer using appropriate units. Show all working.	**4 PS**

		*No. of frames = 12 × 24 = 288 (**1 mark**)*
		*No. of pixels = 640 × 480 = 307200 (**1 mark**)*
		File size = No. of frames × No. of pixels × bit depth
		       *= 288 × 307200 × 8 bits (**1 mark**) **NB: The mark is for the correct GIF bit depth not for the calculation***
		       = 707788800 bits
		       = 88473600 bytes
		       = 86400 Kilobytes
		       *= 84.375 Megabytes (**1 mark**)*
		
		Note: All 4 marks to be awarded for correct response with no explanation.	

27	(c)		The animation is tested on different computers and the colours displayed in the animation vary slightly.	
		(i)	State which software technique could reduce this colour variation problem.	**1 PS**
			*Define/use a CLUT (Colour Look Up Table) for the animation (**1 mark**)*	
		(ii)	Explain how this technique reduces this colour variation problem.	**2 PS**
			• *The CLUT stores the (RGB) code for the colours used* • *The stored colours are a reduced palette/subset of available colours* • *These colours will be the colours displayed when the animation is on screen* *1 mark for each of the two bullets, **max 2.***	
	(d)		The animation files are compressed using LZW. Describe how the *LZW compression technique* compresses files.	**2 KU**
			• *Stores repeated patterns of data (in a dictionary)* • *And stores a code to match these repeating blocks in the file* *1 mark for each bullet point.*	

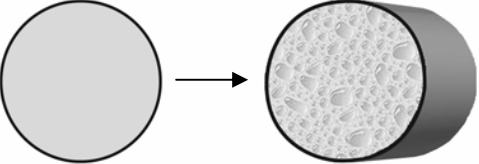| 28	A DJ has connected a record turntable to his computer to transfer tracks from his vinyl record collection to his computer.	
(a)	Describe **one** function of the *sound card* **during** the transfer of the data to the computer.	**1 KU**
	*ADC converts the analogue data into digital (**1 mark**)*	
(b)	The DJ wants to store the tracks with no loss of sound quality. State a suitable file format for storing the tracks without losing sound quality.	**1 PS**
	• *WAV* • *AIF/AIFF (Audio Interchange File Format)* ***1 mark** for either of these.* *Note: **Not** MP3 or wma as both use lossy compression.*	
(c)	Clips from several tracks are combined into a single file, but one of the clips is too quiet and another is too loud.	
	(i) State the technique that should be used to solve this problem.	**1 PS**
	*Normalisation (**1 mark**).*	
	(ii) Describe how your answer to part (i) solves the problem.	**2 KU**
	• *Average or peak volume is determined* • *Relative sound levels are increased or decreased to bring all sounds within range* • *Sound uses the full dynamic range available* ***1 mark** for two of three bullet points.*	

28	(d)	The completed track plays for 5 minutes and is 16 bit stereo with a sampling rate of 44.1 KHz. Calculate the uncompressed file size of this track. State your answer using appropriate units. Show all working.	3 PS

		File size =Time × Sampling frequency × Depth × Channels
		        *= 300 (**1 mark**) × 44100 × 16 × 2 bits (**1 mark**)*
		        = 423360000 bits
		        = 52920000 bytes
		        = 51679.6875 Kb
		        *= 50.5 Mb (**1 mark**)*
		
		Full marks must be awarded for correct answer with no working.	

		The DJ often uses *surround sound* in his shows.	
	(e)	Explain **one** advantage of surround sound over stereo.	2 KU
		• *More channels allow more data to be held* • *Better positioning of sound output/placing of instruments* • *Other valid response* *1 mark for each of two valid points, **max two marks*** *Note: No marks for a simplistic response about more channels/speakers.*	
		The DJ has stored several tracks as *MIDI* files.	
	(f)	Describe how individual notes are stored in the MIDI file format.	2 KU
		*Notes stored using a list of attributes (**1 mark**) such as instrument, pitch, volume, duration, tempo (**1 mark** for any <u>one</u> named)* ***Max 2 marks.***	
	(g)	Describe **one** benefit of using the MIDI file format to store tracks used with surround sound.	2 PS
		• *Can edit attributes of notes* • *To sound differently on different channels/to create special effects* ***1 mark** for each bullet point.*	

29	The developers of a new digital video camera have to decide which communication interfaces to include in the camera. The video camera is to be suitable for *streaming* live video.			
	(a)	Explain **one** reason why a *Bluetooth* interface is unlikely to be chosen for streaming live video.		**2 PS**
		• *Bluetooth has a slow data transfer rate (1 mark) and video files are very large (1 mark)* • *Bluetooth has a limited range (1 mark) so camera would have to be close to computer (1 mark)* • *Other valid reason (1 mark) with explanation (1 mark)* *1 mark for each part of answer, max 2.*		
	(b)	**(i)**	Recommend the most suitable type of interface for this situation.	**1 PS**
			Firewire/USB2.0/USB3.0 (1 mark)	
		(ii)	Justify your choice in part (i).	**2 PS**
			• *Smooth display of live video requires fast data transfer* • *Firewire has faster data transfer than USB 2.0* • *Any other valid point* *1 mark for each valid point* *Note: USB 2.0 has higher bandwidth but is slower because of interface architecture.*	
	(c)	State why it would be an advantage to have *hardware codecs* built in to the video camera rather than loading in the software.		**2 PS**
		• *Compression is done locally* • *Local compression allows capturing of more/longer video* • *File transfer times should be reduced due to the reduced file size* • *Hardware codec is faster than a software codec* • *Any other valid* *1 mark for each of two valid points.*		

30		A museum uses multimedia presentations to provide information about various exhibits. The software that was used to develop the presentations has a *WYSIWYG* interface.	
	(a)	Explain **two** reasons why WYSIWYG would help the developer during the implementation stage.	**2 PS**
		WYSIWYG means slides/frames appear as they would in a viewer/player *Author does not have to save authoring code and then view slides/frames in different viewers/players* *Author does not have to learn authoring code to create slides/frames* *Any other valid reason* *1 mark for any two valid points, **max 2*** *Note: No mark for stating meaning of WYSIWYG.*	
		All of the presentations include links to video clips. The video clips are stored in either *MPEG* or *AVI* format.	
	(b)	Describe how files are stored in the MPEG format.	**3 KU**
		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 point, **max 3.***	
	(c)	AVI does not allow compression but has been chosen for some short clips that are displayed in small windows. Explain why the AVI format is suitable for storing these video clips.	**2 PS**
		*Resolution is limited (to a maximum of 320 × 240) (**1 mark**) but would be suitable for display in a small window (**1 mark**)* *Frame rate is limited (to 30fps) (**1 mark**) but is acceptable for smooth display (above 25fps) (**1 mark**)* *File size is limited (to 2GB) (**1 mark**) but these clips are short (**1 mark**)* *Any other valid point* *1 mark for each part of valid point, **max 2.***	

30			Some of the presentations are made available for downloading from the museum website.	
	(d)	**(i)**	Explain why a *container file* would be used to store the presentations.	**2 PS**
			• *Container files can hold several files (1 mark) of different types (1 mark) (as per multimedia presentation)* • *Less complex download process (1 mark) as a single file to download (1 mark)* • *Single file (1 mark) reduces the likelihood of missing/breaking links between component parts (1 mark)* • *Any other valid reason (1 mark) with explanation (1 mark)*	
		(ii)	Describe **one** problem that may be encountered when using a container file.	**1 PS**
			Software/codec is needed on the receiving computer to recreate the 'contained' files (1 mark)	
			To improve the display of the presentations, the museum upgrades the *graphics cards* on its computers.	
	(e)		Other than converting signals, state **two** ways a graphics card assists the processor when displaying graphics.	**2 KU**
			• *To allow hardware decoding of video/graphics files (using DSP)* • *More (V)RAM to buffer data (using GPU)* • *Provides additional dedicated processor* • *Any other valid response* *1 mark for any two of these bullet points.*	

31	The logo shown is stored as an *object oriented* graphic. The logo appears in a variety of sizes on both printed documents and monitors. 	
	(a) Describe **two** advantages of storing the graphic in *object oriented* format rather than *bitmapped* format.	**2 PS**
	• *Smaller file size/memory/backing storage (for simple/uncomplicated graphics)* • *Resolution independent* • *Allows editing of component objects* • *Object layers can be rearranged* *1 mark for each of the two points.*	

31	One object in the logo is a circle. The circle is altered so that it is shown in 3D.	
	(b) Name **two** additional attributes that require to be stored to create the 3D representation shown.	**2 PS**
	• Texture *• Depth/Z-co-ordinate* *• Direction* *• Lighting* *1 mark for any two valid points.* *Note: No marks for shadow.*	
	(c) Name a suitable file format for the 3D logo.	**1 KU**
	• VRML (Virtual Reality Modelling Language/Virtual Reality Markup Language) *• WRL* *1 mark for either point.* *Note: Do not accept SVG (2D only).*	

[END OF MARKING INSTRUCTIONS]