

**2006 Computing**

**Advanced Higher**

**Finalised Marking Instructions**

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## SECTION I – Software Development & Developing a Software Solution

*Marks*

1. (a) • Assessment of a range of options (indicating advantages/disadvantages of each option). 2  
• Proposed course of action or recommendation to client.  
• Cost-benefit analysis/indication of whether project is economically or financially viable.  
• Schedule – doable within timescale.

*1 mark x 2 benefits*

- (b) (i) • Scope, limits, **boundaries of the problem.** 2  
• **Functional description** detailing what the proposed system will do.  
• **Data description** indicating data types and storage.  
• **Project schedule.**  
• Details of user documentation, details of user training required.

*Answers on the same line should not be treated as different*

*1 mark x 2 items*

- (ii) Comparing with ORD (1) to check that all of the requirements are being met (1). 2

- (c) (i) • **Clients skill level.** 3  
• **Existing documentation** indicating user current experience.  
• **Existing software** indicating staff's current experience/skill.  
• **Development environment.**  
• Hardware and software (OS) that the software will run on.  
• Types of browser used to access as they have different capabilities eg layers, tables.  
• Minimum bandwidth since this will affect users' ability to view graphics, video.  
• Any other acceptable answer.

*1 mark for each of 3 factors*

- (ii) • English statements which have a one to one mapping with code (1). 3  
• Numbering reflects dependency (1).  
• Indentation to indicate control structures such as repetition and selection (1).  
• Data flow informs parameter passing (1).  
• Any other acceptable answer.

*1 mark x 3 aspects*



			<i>Marks</i>	
3.	(a)	(i)	Compares adjacent items at positions one and two and if necessary it exchanges them (1), this is then repeated for the next items two and three, three and four etc causing the smallest/largest item to bubble to the top on the first pass (1).	2
		(ii)	Adams, Armstrong, Robertson, Singh, Jaconelli, Gallagher McBain Adams, Armstrong, Gallagher, Singh, Robertson, Jaconelli McBain  <i>1 mark for each of the lines. Award 2 marks for correct final list.</i>	2
		(iii)	Bubble sort works best on partially sorted list (1) since this minimizes the number of exchanges (1) and since reordering the list would always be done on a randomly ordered list (1) the simple sort would be better. Could mention that many address books are large eg council wide systems.  <i>1 mark for any correct comparison points, 1 for context.</i>	3
	(b)	(i)	set lower to 1 set upper to size of list ( <b>1 mark first two lines</b> ) loop set middle to (lower + upper) div 2 ( <b>1 mark</b> ) if search name > list[middle] then lower = middle + 1 else upper = middle - 1 ( <b>1 mark for correct if statement</b> ) end if until list[middle] = search name or lower > upper ( <b>1 mark for loop with correct termination</b> ) set found to (list[middle] = search name)	4
		(ii)	Fraser, Stella  <i>1 mark x 2</i>	2

			<i>Marks</i>
	(iii)	<p>Lower=1, upper=7, middle to 4 ,compares James with Mehar and since it is less sets upper to 3.  Lower=1, upper=3, middle=2 and compares James to Fraser and since James is greater sets lower to 3  Lower=3, upper=3, middle=3 Compares James with Gillian and since it is greater sets lower to 4.  Lower is now greater than upper so loop ends, found is false. <b>Three comparisons needed (1). Specifying the comparison (2). Termination (1)</b></p>	4
4.	(a)	(i)	3
		<p>DIM card(1 to 10, 1 to 2) As Integer  card [1..10,1..2}] of integer.  Dim card(9,1) as integer</p> <p><i>1 mark for 2D array, 1 mark for both indices, 1 mark for data type.</i></p>	
		(ii)	2
		<p>card(6,1)=attack  card(6,2)=defence  <b>Or</b>  card(5,0)=attack  card(5,1)=defence</p> <p><i>1 mark for each line. Answer needs to be checked against candidates response to (i).</i></p>	
		(iii)	3
		<p>total=0  for counter=1 to 5  total=total + card(counter,2)  next counter</p> <p><i>1 loop and total, 1 mark each for correct index if consistent with candidate's answer in (i).</i></p>	
		(iv)	3
		<p>Card=record  Name:string;  Attack:integer;  Defence:integer;  End</p> <p><i>1 mark for record structure  1 mark for 3 items  1 mark for types.</i></p>	

- |   | <i>Marks</i> |
|---|--------------|
| (b) (i) Stack (1) – since Lifo (1), Queue (1) – taken from the head/top (1)   | 2            |
| (ii) Attack and defence points would be popped from the pair at the top of the stack/queue (1) and the stack pointer/head would be reduced by one (1).        | 2            |
| (c) Open "c:\highscores.dat" For Input As #1<br>For counter = 1 To 5<br>Read #1, name(counter), points(counter)<br>Next counter<br>Close #1                   | 5            |
| <br><i>1 mark open with name</i><br><i>1 mark for loop</i><br><i>1 mark for read with association</i><br><i>1 mark for arrays</i><br><i>1 mark for close.</i> |              |
| (d) Set breakpoints (1) to identify the section of code at which normal execution fails (1).  | 2            |
| <b>Or</b><br>Inspect/watch the contents of specific variables (1) to see if the values are manipulated by program in the way the programmer expected (1).     |              |
| <b>Or</b><br>Trace tables etc.  |              |

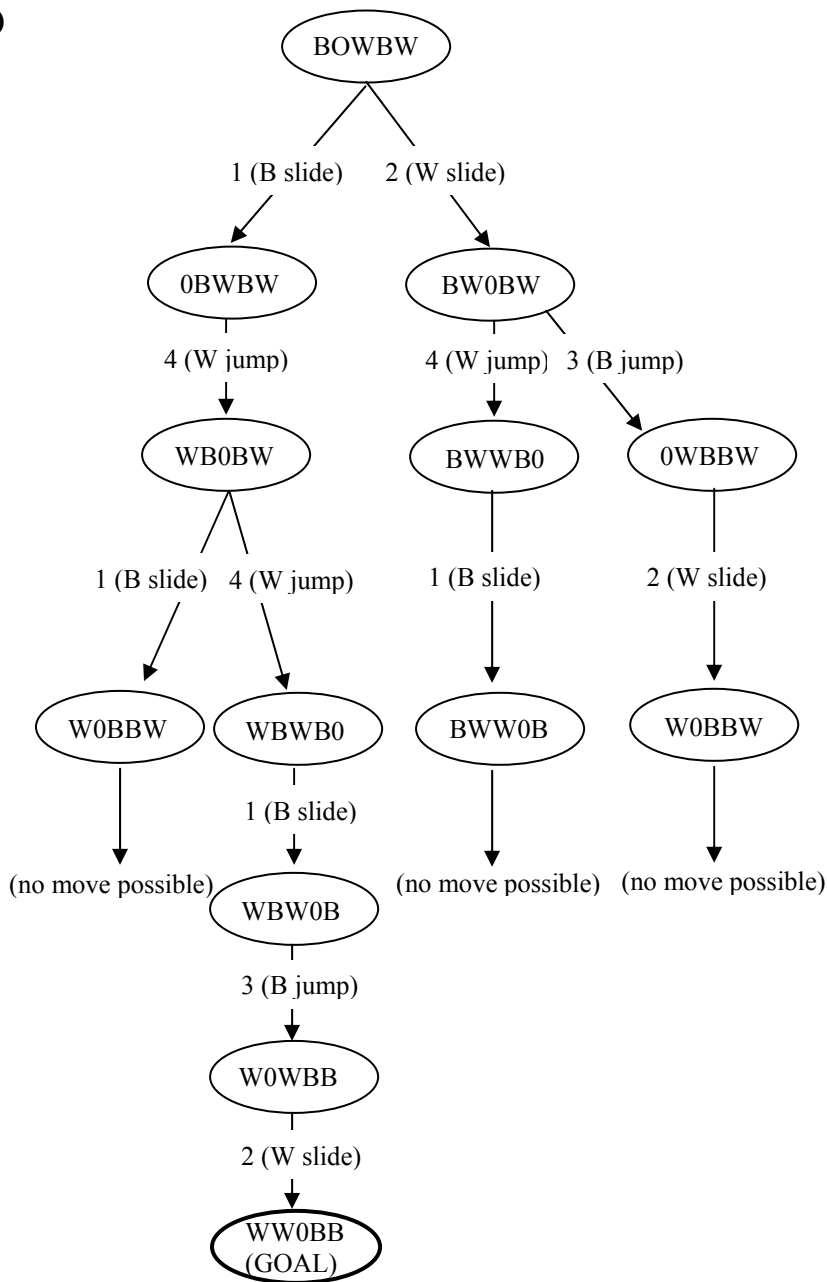
[END OF SECTION I]

**SECTION II – Part A – Artificial Intelligence**

	<i>Marks</i>
5. (a) (i) (W,W,0,B,B)	<b>1</b>
(ii) (B,0,W,B,W)	<b>1</b>
(b) Applying move 1: (B,0,W,B,W) $\rightarrow$ (0,B,W,B,W) Applying move 2: (B,0,W,B,W) $\rightarrow$ (B,W,0,B,W)	<b>2</b>

*Only 1 mark if no indication of which move is being applied.*

(c)



5 marks for a completely correct tree, with all nodes, links and goal state clearly labelled.

5

For an incomplete or incorrect tree, allocate marks as follows:

Nodes: 2 marks for all 13 nodes, 1 mark for 8-12 nodes correct, 0 marks for less than 8 nodes.

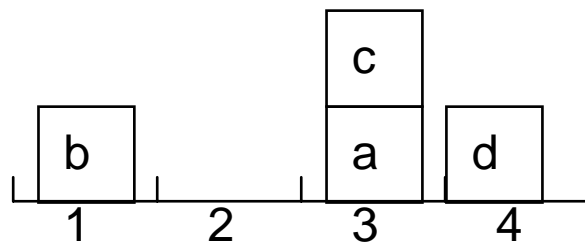
Links: 2 marks for all 15 links, 1 mark for 9-14 links correct, 0 marks for less than 9 links.

Goal: 1 mark for indicating goal state correctly.

**Marks**

6. (a) A heuristic search uses an evaluation function to guide the order of searching nodes. **1**  
Rule of thumb not acceptable.
- (b) Hill-climbing (1) and best-first (1) could be used **2**  
*(there is not enough information given for A\* to be a valid answer)*
- (c) Hill-climbing **1**  
(i) A D J (stop) **2**  
(ii) At each level, it chooses the node with the highest evaluation function (1), and stops at J as the only possible successor does not have a higher value (1).
- Best-first **1**  
(i) A D J P B F K(goal) **2**  
(ii) Chooses D (highest at level 1), then J (highest successor to D), then P (highest successor to J) (1); this is not a goal and has no successor, so it chooses the next highest node which has so far been considered, which is B (1); chooses F (best successor to B), then K (best successor to F); K is a goal, so stops.
- Explanations must refer to specific nodes from search tree
- (d) Advantage – should cut down search time/space (1). **2**  
Disadvantage – needs suitable evaluation function/time taken to calculate evaluation function (1).

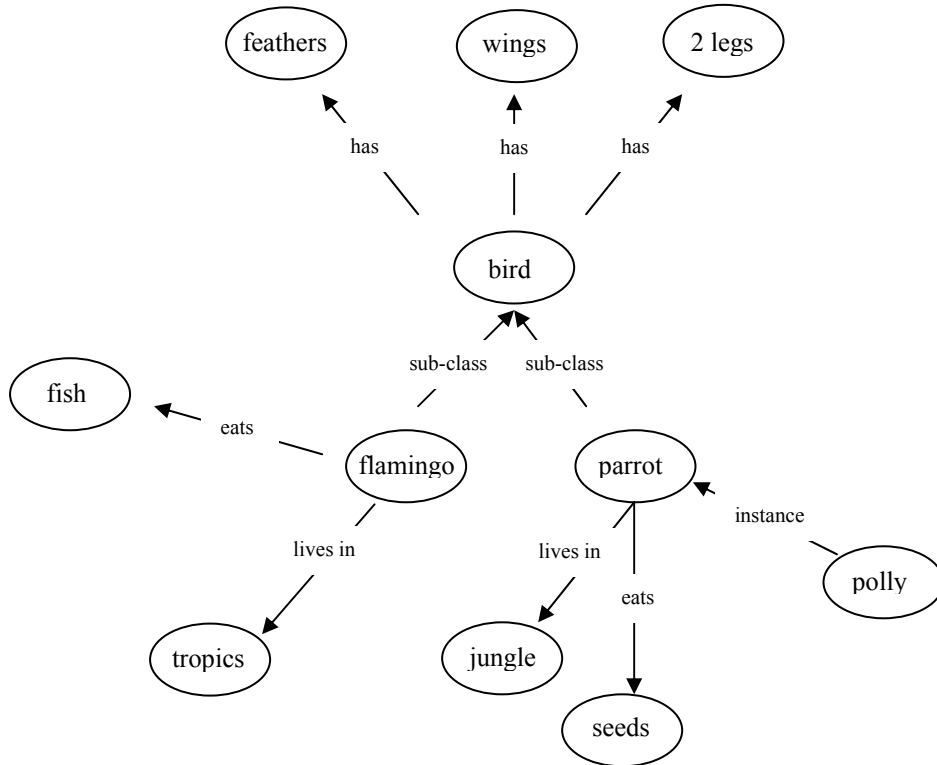
7. (a) **1**



- (b) Block a is under block c, so cannot be moved. **1**

8. (a)

3



*1 mark for including all nodes.*  
*1 mark for correct labelling of arrows (including use of sub-class, instance)*  
*1 mark for correct direction of all arrows*

**Marks**

- (b) has(bird, feathers).  
has(bird, wings).  
has(bird, 2\_legs).  
sub\_class(flamingo, bird).  
sub\_class(parrot, bird).  
lives\_in(flamingo, tropics).  
lives\_in(parrot, jungle).  
eats(flamingo, fish).  
eats(parrot, seeds).  
instance(polly, parrot).  
all predicates arguments should start with a lower case letter.

**3**

*10 correct clauses = 3 marks*

*7 correct clauses = 2 marks*

*4 correct clauses = 1 mark*

*(allow minor syntax errors or variations)*

- (c) eats(X, Y):- instance(X, Z), eats(Z, Y).  
lives\_in(X, Y):- instance(X, Z), lives\_in(Z, Y).

**2**

*1 mark for each rule (allow alternative syntax and variable names, but order of clauses and variables must be correct).*

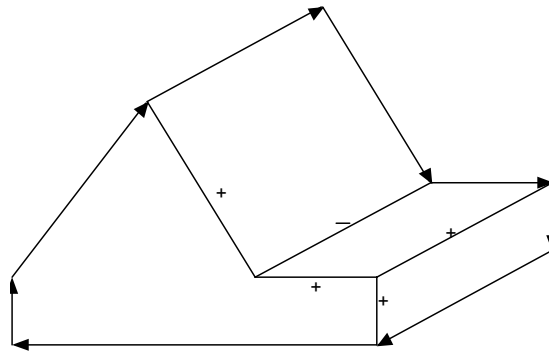
- (d) These ensure (eg) polly, will inherit the properties has feathers, wings and 2 legs (1). The first rule ensures that an instance (polly) inherits the features of the group (parrot) to which it belongs (1). The second ensures that polly is considered to be an instance of a bird (1), since polly is a parrot and parrot is a sub-class of bird (1).

**4**

			<b>Marks</b>
<b>9.</b>	<b>(a)</b>	<b>(i)</b> scotland (no marks if brackets included)	<b>1</b>
		<b>(ii)</b> [england, wales, ireland] ( <i>no marks if brackets omitted</i> )	<b>1</b>
	<b>(b)</b>	<b>(i)</b> X is a member of a list if it is the first member of the list (1).	<b>1</b>
		<b>(ii)</b> X is a member of a list if it is a member of the tail of the list (ie not the first member) (1) – these rules work recursively (1).	<b>2</b>
<b>10.</b>	<b>(a)</b>	CF is a number representing the likelihood of a statement or condition being true (1). In this case, outcomes are not certain (use of word “likely”) (1).	<b>2</b>
	<b>(b)</b>	IF barometric pressure falling AND wind speed increasing THEN storm in next 24 hours CF0.7	<b>2</b>
		<i>1 mark for a correct rule, 1 mark for a sensible certainty factor – between 0.5 and 1, or between 50 and 100</i>	
	<b>(c)</b>	There may be several rules all of which could be true (1). Conflict resolution determines in which order the rules are “fired” (1).	<b>2</b>
	<b>(d)</b>	Maintenance might be required if the expert system was found to make incorrect predictions, or it was to be used in a different geographical situation, or it was to be ported to a different type of computer/OS, or new features were to be added ... (or any 2 valid answers).	<b>2</b>

11.

3

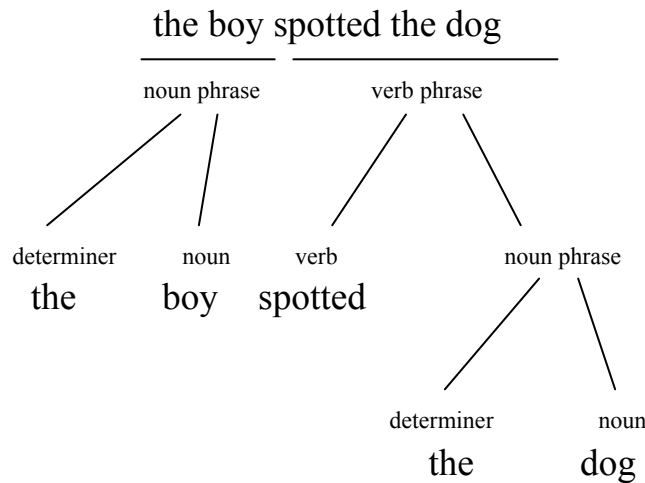


*1 mark for arrows around outside.  
1 mark for the 4 convex (+) lines.  
1 mark for the concave (-) line.*

12. (a) (i) Syntactic analysis is checking that the sentence follows the rules of grammar (1) – both of these sentences are syntactically correct (1). 2

(ii) Semantic analysis is extracting the meaning from the sentence (1) – in these cases, there are several possible semantic ambiguities (eg was it the boy or the dog who had the binoculars in the 1<sup>st</sup> sentence, or (2<sup>nd</sup> sentence) did the boy splash paint on to the dog, or did he just see a dog which had been splashed with paint? (1)) 2

(b) 3



*1 for splitting sentence into np and vp.  
1 for splitting both np into det and n.  
1 for splitting vp into v and np.  
(allow alternative layouts)*

**Marks**

- 13.** Inductive learning is learning from examples (1). An example could be a vision system. It could be trained by showing it many examples of an object. The system would generalise from this, so that it would recognise another example from its main features.

**3**

*1 mark for meaning of inductive learning, plus up to 2 marks for any clearly explained example.*

## SECTION II – Part B – Computer Architecture

	<i>Marks</i>
<p>14. (a) The MDR holds the data which is about to be written to main memory <b>or</b> has been read from memory. The PC holds the address of the next instruction to be fetched from memory.</p>	2
<p>(b) (i) Cache memory lies between the processor and main memory. When data is loaded from main memory a copy is placed in cache memory.</p> <p>The processor checks the cache for data before accessing main memory.</p>	2
<p>(ii) Level 2 cache memory is physically located on the motherboard external to the processor. Level 1 cache memory is located on the processor.</p> <p>Level 2 cache uses data paths external to the processor and L1 cache uses a bus internal to the processor.</p> <p>Level 2 cache memory has a larger capacity, typically 256 – 512 Kilobytes, than level 1 cache memory, typically 8–16 Kilobytes.</p> <p>Level 2 cache is expandable <b>Accept 3 out of these four. 1 mark each.</b></p>	3
<p>(iii) Performance is improved using the level 1 cache memory on the new system because the system now has level 1 and level 2 cache memory and</p> <ul style="list-style-type: none"><li>• access times to data on level 1 cache are even faster than that to data on level 2 cache since it avoids the need to use the bus external to the processor and instead relies on the shorter data paths internal to the processor</li><li>• the bus to which the L2 cache is connected is freed to continue with other transfers.</li></ul>	2

			<i>Marks</i>	
15.	(a)	(i)	Memory is divided up into blocks of memory locations each block with its own address register, data register and connection to the data and address buses: <ul style="list-style-type: none"> <li>• making each block independently accessible</li> <li>• adjacent locations are stored in sequence in adjacent memory blocks</li> <li>• making it possible to access several locations concurrently.</li> </ul>	4
		(ii)	It reduces the effect of wait states (a processing cycle in which the processor waits for data from memory). It compensates for the differences in speed between the processor and the slower speed of the data bus (by enabling several blocks of data to be accessed concurrently).	2
		(iii)	Interleaving is suitable in this parallel processing system because: <ul style="list-style-type: none"> <li>• each memory block can independently accept a memory request</li> <li>• several processors can access the common memory area concurrently.</li> </ul>	2
	(b)	(i)	To achieve communication between processors, parallel computers use: <ul style="list-style-type: none"> <li>• data pathways (buses) to connect clusters of processors, as well as system buses to connect processors and pipelines, enabling the results of one CPU to flow into another</li> </ul> <p style="margin-left: 20px;"><b>Or</b></p> <ul style="list-style-type: none"> <li>• They also use packet switching techniques similar to those used in networks to manage the flow of data between processors. Each packet of data is assigned the address of the processor for which it is intended before being released onto the connecting data pathways.</li> </ul>	2

**Marks**

- (ii) **(Any real work application involving high speed, high volume data processing such as:)**

**2**

Business processing applications involving high volume record processing.

Customer relationship management systems: determining website user behaviour.

Meteorological, financial, scientific applications: analysing patterns and producing forecasts.

Justification along the following lines:

Because these are situations where a large scale task, involving analysing large volumes of data and looking for patterns which can lead to conclusions and to forecasting, can be divided among a set of processors.

***1 mark for example***

***1 mark for justification***

- 16. (a)** From the information given System B will perform better. **3**

It will perform better than System A because:

- it has a 64 bit data bus in contrast to the 32 bit data bus of System A. This means that it is capable of transferring twice as much data to and from memory in one operation as System A.
- System A has the advantage of having a faster processor clock speed, 2.7 GHz as opposed to 2.6 GHz giving approximately a 3.7% speed advantage, but this is more than outweighed by the doubling of the width of the data bus in System B.

- (b) (i)** A PCI is a high bandwidth processor independent bus which supports high speed I/O subsystems such as graphic display adapters, network interface controllers and disk controllers. **2**

- (ii)** The effect will be to boost system performance because, though the later version of PCI has 64 data lines making it equivalent to the PCI-X, it has a bus clock speed of 66 MHz giving it a throughput of 528 megabytes per second whereas the PCI-X has a clock speed of 133 MHz supporting a throughput of 1 Gigabyte per second. **2**

[Note there is an earlier version of PCI which has 32 data lines and a 33MHz clock speed making the contrast even more marked.]

			<i>Marks</i>
17.	(a)	(i) SIMD instructions are Single Instruction Multiple Data instructions which perform a single operation on multiple pieces of data.	1
		(ii) Any example from a multimedia context which can be related to the key points of SIMD: repeated performance of the same simple operation on multiple data. eg a SIMD instruction could be used to change the brightness of an image by increasing the value of each pixel in the image. eg normalising sound files by altering the sound sample values to fall within a set of parameters. <b>Or</b> similar.	2
	(b)	<b>Op-code</b> This describes the instruction <b>or</b> the operation to be performed on the data. <b>Operand</b> The data itself or the location of the data.	2
	(c)	(i) Arithmetic: eg increment, multiply, instructions + explanation	2
		(ii) Data Transfer: eg move, store, instructions + explanation	2
		(iii) Branch: eg jump conditional, jump, instructions + explanation	2
 <i>1 mark for an instruction in each category</i> <i>1 mark for an explanation</i>			

		<i>Marks</i>
18.	<p>(a) Speculative loading of data enables the processor to load data from memory before the program needs it in order to avoid memory latency delays (delaying the processor because of the time taken to read data from memory). Avoiding these delays directly increases throughput of instructions.</p>	2
	<p>(b) (i) Pipelining involves breaking up an instruction cycle into separate stages that occur in sequence eg fetch instruction, decode instruction, fetch operands, execute instruction. Instructions move through these stages, as on an assembly line with each stage in the pipeline working on a different instruction.</p>	2
	<p>(ii) <b>Either</b> Conditional branch instructions can change the sequence of instructions to be executed. The processor is delayed while instructions in the pipeline are cleared and reloaded with instructions from the correct instruction path. <b>Or</b> If different instructions of different lengths are loaded into a pipeline delays can occur because the instructions have different number of steps in their execution cycles. This causes shorter instructions with fewer steps in their execution cycles to be delayed while the longer more complex instructions are processed. <b>Or</b> Data dependency where an instruction depends on the result of other instructions which have not yet been processed</p>	2
	<p>(c) Superscalar processing:</p> <ul style="list-style-type: none"> <li>• divides the CPU into an instruction fetch unit and a number of execution units operating in parallel: in effect using multiple independent instruction pipelines</li> <li>• each pipeline consists of multiple stages so that each pipeline can handle multiple instructions at a time.</li> </ul> <p>Superscalar processing is, therefore, based on the idea of pipelining. This extension of the technique of pipelining enables it to implement a form of instruction based parallelism, and so process more than one instruction per clock cycle.</p>	3

**(d) Predication**

This is a technique which enables a processor to improve performance by avoiding problems caused by conditional branches in a stream of instructions.

**4**

Predication enables a processor to feed instructions in both paths in a branch into an instruction pipeline without waiting for the condition to be evaluated.

When the instruction path in a program branches into two paths eg based on a condition, the processor executes instructions on both paths while waiting for the condition to be tested.

Then, once the condition has been tested, it discards the unwanted results and continues with the results on the other path

**Or**

**Branch prediction**

Common technique is to maintain a branch history table which keeps a record of conditional branch instructions and uses this table to predict which branch will be processed then fetches the relevant instructions

**Or**

**Data flow analysis**

- Processor analyses which instructions dependent on each other.
- Processor creates an optimised schedule of instructions.
- Instructions are executed according to the schedule regardless of the original place in the program.
- Thus preventing unnecessary delay in the processing.

**19. (a)**

**Comparing processing**, a GUI needs to:

- process the signals from the optical or mechanical device which traces the movements of the mouse.
- convert the number, combination and frequency of the signals into the distance, direction and speed of the mouse.
- use this data to move the on-screen cursor which is controlled by the mouse.
- process the signal, or sometimes double signal from a double click, in combination with the cursor position to calculate the operation the user wishes to be performed by the system.

**6**

**CLI**

In comparison the processing demands of a text based command line HCI are relatively straightforward, involving interpreting and executing the command.

**Comparing demands on memory**, a GUI needs to:

- store data about the signals from the mouse, the position of the cursor, the graphic data about the display of the icons menus and windows.
- based command line HCI makes less demands on memory because it simply needs to store the text based command.

**Any 6 of the above 7 points**

- (b) Syntax:  
In a text based HCI the precise command which the user must enter to have an operation carried out. **2**

**Or**

In a GUI based HCI the syntax would be the series of steps involving manipulating a mouse and clicking on a file icon which the user would have to carry out in order to open a file.

Semantics:

is the meaning of the command or the clicking of the mouse which normally causes an operation to be performed, in this case the opening of a file.

**SECTION II – Part C – Computer Networking**

**Marks**

20. (a) (i) Accept one of the following: 1
- devices built to standards will be able to operate alongside hardware created by other companies who also follow standards and so the number of potential buyers increases
  - other similar answer relating to market potential.

- (ii) Accept one of the following: 1
- the engineer will not have to design from scratch, he will simply follow the standard
  - he may be able to use open source software or other libraries of subroutines already written to control the hardware
  - there will already exist components which he might use within the device which have been built to comply with standards.

- (b) 3

OSI	TCP/IP
Application	Application
Presentation	
Session	
Transport	Transport
Network	Internet
DataLink	Network
Physical	

This diagram or equivalent explanation would merit the 3 marks, 1 mark for OSI layers, 1 mark for TCP/IP layers, and 1 mark for appropriate mapping.

- (c) (i) In the above example the addition of “/26” at the end of the address indicates that 26 bits are used to identify the network (1 mark) – leaving 6 bits to identify up to 64 (or 62) different hosts (1 mark). 2

- (ii) Accept one of the following: 2
- the Class system uses a set number of bits to identify networks whilst CIDR can use varying numbers, of bits (1 mark). This leads to a great deal lower redundancy rate of unused IP addresses (1 mark)
  - the example shown refers to a network which can have up to 64 hosts, the smallest network in the class system was 256 (1 mark) therefore 192 addresses would have been wasted (1 mark).

			<i>Marks</i>	
21.	(a)	(i)	<p>UTP, depending on the category of cable used will deliver from 10Mbps to 1Gbps although more is possible. Fibre is capable of delivering anything from 100 Mbps up to several Gbps.</p> <p>Must be realistic <u>ranges</u> in answers</p>	2
		(ii)	<p>Accept high bandwidth with appropriate description of need (2 marks) or accept any 2 other legitimate points eg the connection between hospitals may not need to be extremely fast, however, it will have to be reliable and secure. Fibre is much more difficult to tap into and does not suffer from any electro-magnetic interference. (1 mark). Fibre can also have runs of up to 2km before requiring strengthening and in these situations may cost little more than using standard cabling (1 mark). It also guarantees that the necessary bandwidth will be available if demand increases.</p> <p>Accept UTP within building justified by cost for 1 mark.</p>	2
	(b)	(i)	<p>Full: A complete copy of all the files on the computer are copied onto a separate medium, often tape. Differential: A copy is made of all updated files since the last full backup. Incremental: A copy is made of all updated files since the last differential or incremental backup.</p>	3
		(ii)	<p>Full backup daily (1 mark). <b>Timing of full backup</b> should be in the middle of the night (1 mark). An incremental backup being taken at regular intervals until the next full backup (1 mark). A differential backup being taken after a set number of incremental backups (1 mark).</p>	4
	(c)	(i)	<p>Range: Bluetooth: Approx. 30 feet, 802.11g: 150 feet Rate: Bluetooth: 64 Kbps, 802.11g: 54Mbps. 1 mark for each correct comparison. Specific values should be quoted and compared.</p>	2
		(ii)	<ul style="list-style-type: none"> <li>• Security: may allow intrusive monitoring of patients condition by external bodies eg reporters.</li> <li>• Possibility of interference with other machinery eg no mobile phone use is currently allowed in hospitals.</li> <li>• Other answers may be acceptable.</li> </ul> <p><i>1 mark for each relevant point.</i></p>	2

		<i>Marks</i>
(d)	(i)	A network that is constructed by using public wires (1) to connect nodes and which restricts access to authorised users (1). <span style="float: right;">2</span>
	(ii)	Extra hardware required by each surgery and consultant will consist of; a reasonable specification PC, a video camera (accept a high resolution Web cam), speakers, large high resolution monitor, hardware codec for compression/ decompression. <b>Need</b> for hardware and software must be clear. Software would have to include a video-conferencing package that supports video conferencing over IP. The network connection at both the surgery and the hospitals would have to be fast (at least 500Kbps ADSL). <span style="float: right;">2</span>
		<i>1 mark for each implication to a max of 2 marks.</i>
	(iii)	Less need to travel to hospitals. <span style="float: right;">2</span> More efficient use of doctor time resources. Patients more comfortable with own GP. Consultant gets benefit of GP's knowledge of patient. GP gets benefit of consultants expert knowledge. Less waiting time for appointments.
		<i>1 mark for each relevant point to a max of 2 marks.</i>
22.	(a)	A specific IP address (or addresses) may be allowed access to the LAN. <span style="float: right;">2</span>
		A specific port (relating to a service eg ftp port 20 or 21) could be blocked.
		<i>1 mark for each appropriate suggestion.</i>

**Marks**

- (b) 1. Connection sharing: local nodes requesting URLs make the request to the proxy server (1 mark) and the proxy server requests the URL (1 mark). **4**
2. Caching: it can store Web pages which have already been requested (1 mark), and will be able to deliver its content to any other local machine much faster than otherwise possible (1 mark) OR reduce the traffic on the external connection (1 mark).
3. Firewalling and filtering: as it receives all incoming traffic it can be configured to give greater protection than a firewall as it can inspect the actual URLs and deny access according to preset rules.
4. Logging access: a proxy server may be used to keep a log of each users browsing history and therefore provide evidence of misuse of the Internet connection.
5. Hiding of IP address by use of NAT

**2 marks for clear description of function and 1 mark if vague**

- (c) (i) Ping or Packet Internet Groper is a command that sends an ICMP command echo request to a host (1 mark), the host then returns the packets (1 mark). **2**

- (ii) Router disconnected **2**  
Network card damaged/not operating.  
Loose or faulty cabling.  
Proxy server off-line.  
Firewall off-line.  
ISP off-line

**1 mark for each relevant point to a max of 2 marks.**

- (d) He would request that the intended recipient use the software to generate a public (and a private key) (1 mark). **3**

The recipient would then send the employee a copy of the public key that would be used in the encryption process. (1 mark).

The private key would then be applied to the encrypted attachment to decode it (1 mark).

23. (a) Accept one of the following: 2  
 Bandwidth issues not accepted
- the computers which did run the simulation may have had a plug-in downloaded and installed eg Macromedia Shockwave which was allowing the simulation to be displayed. The required plug-in should be identified and installed
  - the users logged in at the two computers may have different levels of access, eg one may be allowed to write to the hard disk (this may be required by the simulation) and the other one not. The solution then would be to alter the users permissions appropriately
  - the browsers own security settings may have been set differently and would need to be altered to allow the simulation to run.
- (b) (i) ActiveX controls are sets of instructions which can be processed from within a Web browser (1 mark). 1
- (ii) Windows 1
- (iii) 2
- Java applets run in a sandbox and therefore cannot affect the local hard disk, therefore they are less likely to give rise to security problems.
  - Java applets are able to run on any platform as they rely on being translated by a virtual Java interpreter, a version of which is available for all common platforms, whereas ActiveX can only run on Windows based machines therefore in a cross platform situation Java is the best solution.
- (iv) `<a href="http://www.highersystems.org/">Higher Systems Revision Material</a>` 3
- 1 mark for anchor tags, 1 mark for use of href with URL and 1 mark for text of link.*
- (c) 4
- The connection: The client makes a TCP connection with the HTTP server (normally on port 80, unless some other port is specified and the server responds).
  - A request by the client: The client sends a request to the server requesting a page at a specified location. (A typical request is: GET /index.htm HTTP/1.0.)
  - The response by the server: The server sends the data back to the client as lines of ASCII text. (The first line is typically: HTTP/1.0 200 OK.)
  - Closing the connection: Either the client or the server, or both close the connection.

**1 mark for each stage.**

		<i>Marks</i>
<b>(d)</b>	<b>(i)</b> Buffer overflow attacks, SYN flood attack, Teardrop attack, Smurf Attack, DNS cache poisoning.	<b>1</b>
	<i>Any 1 for a mark.</i>	
	<b>(ii)</b> 2 marks for a good description of attack named and 1 mark for a vague description.	<b>2</b>
	<b>(iii)</b> 1 mark for any appropriate preventative step related to the named attack.	<b>1</b>

[END OF SECTION II – PART C]

[END OF MARKING INSTRUCTIONS]