**Q1.**

Explain some of the challenges that face legislators in the digital age.

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**(Total 3 marks)**

**Q2.**

Google have a service called Street View which allows a user to view surroundings from street-level. Google have extended their Street View service to cover the inside of buildings such as museums and sports stadiums.

Discuss a range of ethical, legal and cultural issues that Google may have needed to deal with when extending the service.

**(Total 9 marks)**

**Q3.**

Between 2008 and 2010, a company that was gathering data for an online mapping system, using cars fitted with cameras and WiFi equipment, collected some information that was being transmitted on personal WiFi networks. The company apologised for doing this and an investigation found that a small number of software developers had been responsible for adding this functionality to the mapping system data collection software.

In the context of this example, discuss:

•   how it was possible for this data to be collected.

•   what steps the owners of the networks could have taken to prevent the data from being collected.

•   what legal and ethical issues might have arisen as a result of collecting this data.

•   what lessons the company might have learnt from the incident and how their practices might have changed as a result of it.

In your answer you will be assessed on your ability to follow a line of reasoning to produce a coherent, relevant and structured response.

**(Total 12 marks)**

**Q4.**

(a)     Describe **two** important properties of a robot.

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**(2)**

(b)     Do you believe that a computer will ever be as intelligent as a human being?

Tick **one** row in the table below to indicate your opinion, then, in the space underneath the table, give reasons for this. Marks will be awarded for the development of a reasoned justification of your opinion.

|  |  |
| --- | --- |
| **Statement** | **Tick One** |
| A computer will, at some time in the future, be as intelligent as a human being. |   |
| A computer will never be as intelligent as a human being. |   |

Reasons\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(3)**

(c)     (i)      Some people say that a hacker is someone who loves to program or who enjoys playful cleverness, or a combination of the two.

What is the more common definition of a hacker?

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**(1)**

(ii)     Which law aims to protect companies against computer hacking?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(iii)    Identify **two** reasons why it is difficult to identify and catch computer hackers.

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**(2)**

**(Total 9 marks)**

**Q5.**

(a)     Below is a numbered list of the names of some of the legislation that applies in situations where computers are used:

1. Copyright, Designs and Patents Act
2. Computer Misuse Act
3. Regulation of Investigatory Powers Act
4. Health and Safety Regulations
5. Data Protection Act

For each of the situations given below, identify the relevant legislation which is being followed. Write the number that corresponds to the appropriate legislation in the box given after each situation.

Marcus wanted an MP3 of a recent song so he went to an online music store. After paying he was able to immediately download the purchased song.

|  |  |  |
| --- | --- | --- |
|   | Legislation |  |

A new workstation is installed in an office and an assessment is performed regarding the lighting for the workstation and the positioning of the desk, monitor and chair.

|  |  |  |
| --- | --- | --- |
|   | Legislation |  |

Mr Smith hands over his 50-character encryption key in response to a request from the authorities investigating a fraud case.

|  |  |  |
| --- | --- | --- |
|   | Legislation |  |

**(3)**

(b)     The operators of a number of multi-storey car parks have installed systems to scan and recognise number plates. The system is used at both the entrance and exit of the carparks so that the arrival and leaving times can be recorded.

Customers can set up an account so that money is automatically debited when their car number plate is recognised as the car leaves the car park.

Customers who do not have an account can use their mobile phones to pay the car parking fees by sending a text message to a specified number with their number plate details and length of stay.

As these car parks are based around the UK the company also collects location-specific data.

(i)      The number plate recognition system uses CCTV cameras and OCR software.

What is the full name of the technique known by the abbreviation OCR?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)     The company will need to follow the Data Protection Act as they will be storing personal data.

What is meant by personal data?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(iii)    Why might the storing of number plate details, mobile phone numbers and location-specific data be a concern for privacy campaigners?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

**(Total 7 marks)**

**Q6.**

A school has recently launched a ‘Parent Portal’ which is a website that provides information from the school. By logging on to the portal a parent can access the information that is stored about their son or daughter. This information includes academic reports, discipline records and other personal data.

(a)     A parent recently contacted the school because he was concerned that when he logged on to read his daughter’s report he could access the reports of all the other students.

The school should immediately look into this concern as a law has been broken.
State the **full name** of the law that has been broken.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(b)     Which principle of the law identified in your answer to part (a) has been broken?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(c)     State another principle of the law identified in your answer to part (a).

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**(1)**

(d)     A parent also noted that the website was using HTTP (HyperText Transfer Protocol).

Why should the school be concerned about the use of this protocol and which protocol would you recommend that the school should use instead?

Why concerned \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Suggested protocol \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

(e)     The process of writing reports and then allowing access to these reports via the parent portal involves the use of many different categories of software.

Below is a list of different categories of software:

Operating system, Utility program, Special purpose application software, Bespoke application software, General purpose application software

Complete **Table 1** by writing the correct category from the list above in the **Category** column next to the appropriate **Software**.

You should **not** use a category more than once.

**Table 1**

|  |  |
| --- | --- |
| **Software** | **Category** |
| Word processor used to write the pupil reports |   |
| The parent portal web application which was programmed for this school |   |
| The web server software run by the school |   |

**(3)**

**(Total 8 marks)**

**Q7.**

Students often search online for music files and then download them to their computer, mobile phone or music player.

(a)     State the **full name** of the law that students might have broken by downloading music files in this way.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(b)     State **two** arguments against music being available for free on the Internet.

Your answers should **not** refer to the law asked for in part (a).

Argument 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Argument 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

(c)     Many websites now offer the ability to download music files which are without any DRM(Digital Rights Management) protection.

State **two** advantages to students of DRM-free files over files that have DRM restrictions.

Advantage 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Advantage 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

**(Total 5 marks)**

**Q8.**

An ICT technician at a secondary school has access to a variety of programs that she uses to manage a group of servers.

(a)     State **one** use for each of the protocols listed below.

(i)      Telnet: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)     FTP: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(iii)    POP3:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(b)     Whilst remotely connecting to one of the servers the technician executes a command that displays the current network connections. The table below shows these network connections.

|  |
| --- |
| Active Internet Connections |
| Proto | Recv–Q | Send–Q | Local Address | Foreign Address | (state) |
| tcp4 | 0 | 0 | 192.168.3.205:80 | 74.125.4.148:58539 | ESTABLISHED |
| tcp4 | 0 | 0 | 192.168.3.205:80 | 208.43.202.29:57458 | ESTABLISHED |
| tcp4 | 37 | 0 | 192.168.3.205:25 | 208.43.202.29:57459 | CLOSE\_WAIT |

From the table above provide an example of the following:

(i)      IP address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)     Port:: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(iii)    Socket: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(c)     State **two** reasons why the technician uses remote management software from her computer rather than going to the actual servers.

Reason 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Reason 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

**(Total 8 marks)**

**Q9.**

You have been asked to design and set up a computer work area for the employees of a library.

(a)     State the legislation that is concerned with how the work area should be physically set out and state two ways that this legislation will affect the design.

Legislation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Affect 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Affect 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(3)**

(b)     Application software has already been installed onto computers in another room.

(i)      State the **full name** of the law that may be broken by installing the same software onto the new computers.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)     What information should you find out before installing this software to ensure that you will comply with the law identified in part (i)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(c)     As soon as an employee logs onto one of the computers they have to agree to the Code of Conduct relating to their use of the computer system.

What is a *Code of Conduct*?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

**(Total 6 marks)**

**Q10.**

There are various formats of optical storage media currently available.

(a)     Choose the most appropriate medium from the list below that would be best suited to the purpose given. Write your answer in the Medium column in the table below. You must **not** use the same medium more than once.

CD-ROM, CD-R, CD-RW, DVD-R, DVD-RW, Blu-Ray

|  |  |
| --- | --- |
| **Purpose** | **Medium** |
| To distribute 300MB of commercial software |   |
| To store a 20GB high definition movie file |   |
| To use for a 3GB archive of the data on a school server |   |
| To create a copy of a 60 minute audio music album |   |

**(4)**

(b)     Describe how data is written to and read from a CD-R disk.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(3)**

(c)     A series of word-processed documents have been archived onto CD-R.

State **two** reasons why in 20 years’ time it might be impossible to open up these documents.

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**(2)**

**(Total 9 marks)**

**Q11.**

A well established use for robots in industry is the spraying of car bodies on a car production line.

A robotics researcher is investigating the feasibility of developing and installing in a car a computer-based control system to take over completely the driving of the car on public highways.

She has identified some of the inputs into the control system already:

•        detailed map

•        current weather report.

And some of the outputs:

•        position of steering wheel (in degrees from the vertical)

•        forces on accelerator and brake pedals.

Discuss why automated car control is a harder programming problem to solve than developing programmed control of a robot for spraying car bodies on a car production line.

For full marks your discussion must cover both programming problems.

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**(Total 4 marks)**

**Q12.**

(a)     If you borrow a shop bought music CD and “rip” (copy) the tracks to your hard disk before you give the CD back to your friend, you have probably broken a law.

State which law you are likely to have broken.

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**(1)**

(b)     Alternatively, you could download music from an official music website on the Internet. The website owners might protect this music using Digital Rights Management.

Give **two** examples of how Digital Rights Management could prevent you from sharing downloaded music with a friend.

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**(2)**

**(Total 3 marks)**

**Q13.**

What are machines good and bad at, in comparison to humans?

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**(Total 4 marks)**

**Q14.**

(a)     State a task that could be carried out by a robot.

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**(1)**

(b)     Explain why a robot is suited to completing the task that you have identified in part (a).

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**(2)**

**(Total 3 marks)**

**Q15.**

Discuss the arguments for and against the use of Digital Rights Management (DRM) to protect digital music and videos.

In this question you will also be assessed on your ability to use good English and to organise your answer clearly in complete sentences, using specialist vocabulary where appropriate.

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**(Total 6 marks)**

**Q16.**

A company that develops computer software has just taken on a new employee.

(a)     The actions of the employee and company are covered by several laws.

Name the law that would be most relevant in each of the following cases.

(i)      The employee brings into work a copy of a computer game that he has purchased and already installed on his home computer. He installs it on his work computer.

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**(1)**

(ii)     The employee gains access to company confidential data by correctly guessing a manager’s username and password.

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**(1)**

(iii)     The company issues the employee with a voucher once a year for a free eye test.

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**(1)**

(b)     The company makes the employee sign a Code of Conduct before he is allowed to start work.

(i)     What is a Code of Conduct?

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**(2)**

(ii)     Why does the company have a Code of Conduct rather than just expecting employees to obey the law?

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**(2)**

**(Total 7 marks)**

**Q17.**

Imagine that you are a computer programmer in a company that stores personal data. The company must comply with the Data Protection Act.

(a)     What is personal data?

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**(1)**

(b)     You are writing a new program to handle personal data.

State **one** principle of the Data Protection Act that could be met by the careful design of your program.

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**(1)**

(c)     Name **one** feature that you could include in your program and describe how it would help the company comply with the principle stated in part (b).

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**(2)**

**(Total 4 marks)**

**Q18.**

A company sells music to its customers over the Internet. The music can be downloaded as files and saved on the user’s computer. It is protected by Digital Rights Management (DRM).

(a)     What is DRM and why does the company use it to protect the music that it sells?

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(b)     Explain how the company could use DRM to protect its music.

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**(Total 5 marks)**

**Q19.**

A company stores all its data in an on-line information retrieval system. Some of this data is personal data about the employees; some of it is confidential data about the business. All staff have authorised access to those parts of the system which they need to carry out their job role.

(a)     (i)      Describe **two** distinct steps that should be taken to minimise unauthorised access by staff to those parts of the system they have no need to access in order to carry out their job role.

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**(4)**

(ii)     How could such unauthorised access be detected?

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**(1)**

(b)     What safeguards should be used to keep the data protected from loss or corruption due to:

(i)      Hackers

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**(1)**

(ii)     Viruses

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**(1)**

(iii)     A system failure caused, for example, by a power cut?

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**(1)**

(c)     Describe **one** further safeguard which needs to be in place to enable the company to get back into operation swiftly and effectively after a serious problem causing a complete system failure.

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**(1)**

**(Total 9 marks)**

**Q20.**

An architect has been asked to design a ‘smart’ home using components of a computer-controlled home automation system, for a client who uses a wheelchair. The client cannot stand easily and has limited use of their arms.

The architect has the following components to choose from:

•        Radio-frequency remote controls

•        Programmable switching units to control appliances

•        Movement detectors

•        CCTV (Closed Circuit TV)

•        Fingerprint door locks

•        Climate control system

•        Motors to operate doors/curtain-rails/shutters

•        Voice recognition system

For **three** of the above devices, state the device and explain its use for a home automation system and why it would help the client.

Device 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Why: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Device 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Why: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Device 3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Why: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(6)**

**(Total 6 marks)**

**Q21.**

(a)     Spam is unwanted advertising e-mail. It has been estimated that it accounts for more than half of e-mail traffic. Explain **three** different unwelcome consequences of spam; **one** social, **one** economic and **one** ethical.

Social \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

Economic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

Ethical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

(b)     Give **one** method of restricting the effects of spam.

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**(1)**

**(Total 7 marks)**

**Q22.**

Computer software is protected by the Copyright, Designs and Patents Act 1988, amended by subsequent legislation.

(a)     What is meant by copyright in the context of computer software?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(b)     Under the terms of the licensing agreement, what is a purchaser legally entitled to do with the purchased PC software?

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**(1)**

(c)     Give **two** ways a purchaser might wish to use the purchased PC software, which are forbidden under this legislation.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

**(Total 4 marks)**

**Q23.**

A company backed by the UK government has been set up to provide on-line degrees from UK universities. All study material, tutorials and assessment will be on-line.

Students, aged 18 to 80, from all over the world have registered to study courses.

Businesses are also being encouraged to take advantage of this scheme for the continuous professional development of their employees.

(a)     Give **one** economic or social advantage to **each** of the following:

(i)      UK universities for being partners in this scheme;

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**(1)**

(ii)     students living overseas for registering with such a course of study;

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**(1)**

(iii)     businesses for registering their employees on such a course of study.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(b)     Certain hardware and software are specifically required to study in this way.

Give **one** example of:

hardware; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

software. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

**(Total 5 marks)**

**Q24.**

A well-known software company has constructed a media player to query an on-line database at the company’s headquarters. It retrieves the titles of tracks on audio CD’s for display in the media player’s window. In the process it assigns a unique identifying digital fingerprint to the computer playing the audio track.

In a separate transaction, the company can then link this digital fingerprint to an e-mail sent from the same computer. This links the user’s e-mail address to the music interests of the user for marketing purposes.

(a)     Explain one benefit to

(i)      the user

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**(1)**

(ii)     the software company.

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**(1)**

(b)     Why might the use of the link be considered unethical?

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**(1)**

**(Total 3 marks)**

**Q25.**

The United Kingdom’s National Health Service was created to provide health care to the nation through:

•        hospitals

•        health centres/GPs’ (doctors’) surgeries

•        pharmacies (chemists).

The UK government is proposing to computerise and network the entire National Health Service (NHS) so that it will be possible to have on-line *access to the system at a level of security relevant to their status* for anyone who

•        works for the NHS

•        uses its services

•        works at a branch of government responsible for the NHS.

Patient records will be stored in multi-user distributed relational databases managed by *Database Management* *Systems* (DBMS).

•        Every person in the UK is assigned a unique numeric key, *the patient reference number*, and is assigned for primary health care to a doctor in a health centre or a GPs (General Practitioner’s or doctor’s) surgery located in a single building.

•        A person’s doctor may, if necessary, arrange for the person to see a specialist doctor in a hospital.

•        Drugs prescribed for a person by the person’s GP for the treatment of an illness are obtained from a pharmacy.

•        Every computer in the service of the NHS will be interconnected in *local area networks* (LANS) and the *local area networks* will be interconnected by a *wide area network* (WAN).

Which network type is most appropriate, WAN or LAN, **within** a health centre or GPs (doctor’s) surgery? Justify your choice.

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**(Total 2 marks)**

**Q26.**

Electronic Funds Transfer (EFT) makes it possible for a company in the UK to pay for goods manufactured in Malaysia without needing physically to exchange money in the form of coins, notes or cheques. The transfer is carried out electronically by messages sent between the company’s bank and the supplier’s bank.

(a)     Why must EFT systems be available for use 24 hours a day?

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**(1)**

(b)     EFT messages are encrypted before being sent. Give **one** reason why this is done in this context.

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**(1)**

(c)     Some governments have passed laws that require banks to lodge with them the encryption keys that are used to decrypt EFT messages. Give **one** reason why this is done.

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**(1)**

**(Total 3 marks)**

**Q27.**

In some countries government agencies routinely monitor the content of e-mail routed over the Internet.

(a)     Give **two** reasons why some governments may allow this to happen.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(b)     Suggest **one** way in which an individual may make it difficult for any such agency to read the content of a particular e-mail sent over the Internet.

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**(1)**

**(Total 3 marks)**

Mark schemes

**Q1.**

**All marks AO1 (understanding)**

**One mark** per challenge that is explained.

Information can be combined / processed / transferred in ways that were not previously possible; **A.** an example of this **NE.** there is a lot more data

Technology evolves quickly (so difficult for law to keep up with changes) // new types of crime become possible // some crimes are easier // future problems may not be understood;

Global nature of Internet means crimes may be committed in one country from outside its direct jurisdiction // laws are often national/local whilst the Internet is global // digital crime can be committed from a great distance // different countries have different laws;

Some crimes may be committed by states rather than individuals;

Different countries / cultures may have different attitudes to principles important to computer science (such as copyright, intellectual property, privacy); **Note:** this point relates to attitudes not legislation

Methods such as encryption make it harder to monitor criminal activity // electronic evidence may be harder to gather than physical evidence // can be harder to identify culprits online (eg by use of proxies, VPN) // peer-to-peer systems make it harder to identify criminal; **NE.** hard to catch criminals

Individuals may have access to large amounts of sensitive information that may be of public interest // conflicts between freedom of speech/information and privacy / state secrets;

Technology companies (can use their wealth) to lobby for their own interests // concern over influence of companies on legislators;

Resources required to enforce legislation may not be available;

**NE.** Copyright, Data Protection, Misuse, Hacking

**Refer responses containing other relevant points to team leaders.**

**Max 3**

**[3]**

**Q2.**

**Marks are for AO2 (analyse)**

**Level of response question**

|  |  |  |
| --- | --- | --- |
| **Level** | **Description** | **Mark Range** |
| 3 | A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically structured response. The response covers ethical, legal and cultural issues. In these areas, there is sufficient detail to show that the student has a thorough level of understanding of the issues involved. Although understanding would be indicated by two or three points being made in each of the areas, potentially thorough coverage of two areas might exceptionally lead to a mark in this band. | 7-9 |
| 2 | A line of reasoning has been followed to produce a mostly coherent, relevant, substantiated and logically structured response that covers at least two of ethical, legal and cultural issues. In at least one of these areas, at least two valid points must have been made that demonstrates a good understanding, and typically students should have made at least two points in two areas. | 4-6 |
| 1 | A few relevant points have been made and there is limited evidence that a line of reasoning has been followed. | 1-3 |

**Points may include:**

**Ethical:**

Consider if material in images could be of harm to children.

Identifying and requesting permission from any members of public caught on the images.

Members of the public may not be as happy being photographed in a building as they are on the streets.

Recording of adverts could lead to unfair product placement.

Considering what harmful uses users of the system might use the captured images for.

Considering how often Google should update the image data.

Dealing with copyrighted information that might have been inadvertently captured.

Considering that access via Street View might reduce the number of paying customers for museums.

Are young people being dissuaded from leaving home to visit public buildings leading to poor health.

Need to consider which areas of a building are appropriate to film (eg toilets, offices, research laboratories)

**Legal:**

Does Google need permission to film in what might be a private building.

It may not be legal to film people without permission (on private land).

Aspects of data protection legislation might apply.

Copyrighted information might be inadvertently captured and may lead to legislation breach.

Consider if material in images is legally allowed to be viewed by children.

Could be a risk of identifying items to steal leading to liability for crimes being carried out.

Ability to identify locations and access could be used for crime or to carry out acts of terrorism.

Street View is a worldwide service so would need to consider different legal systems.

Consideration of the security of information storage needs to be made.

Laws for certain buildings or areas of buildings may be more restrictive than others.

**Cultural:**

Some images of people or exhibits may be offensive to certain cultures.

Taking images inside religious buildings for some purposes may be considered inappropriate.

Some cultural beliefs may not allow photography of people.

Do people have the right to request the deletion of their images?

Could the culture of visiting places such as museums (e.g. family/school day trips) be affected by access to them online?

Need for balance between cultural sensitivities and freedom of expression.

**NE**. Without suitable context: Faces need to be blurred out, must comply with laws, invasion of privacy.

**R**. Reference to private homes, implication that will be used for live monitoring.

**[9]**

**Q3.**

**Marks is for AO2 (understanding)**

|  |  |  |
| --- | --- | --- |
| **Level** | **Description** | **Mark Range** |
| 4 | A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically structured response. The response covers all four areas indicated in the guidance below and in at least three of these areas there is sufficient detail to show that the student has an excellent level of understanding of the issues and technologies involved. To reach the top of this mark range, an excellent level of understanding must be shown of all four areas. | 10-12 |
| 3 | A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically structured response but the response may only cover two or three of the areas indicated in the guidance below. A good understanding is shown of each of these areas and if only two areas are covered, the coverage of these is excellent. | 7-9 |
| 2 | A limited attempt has been made to follow a line of reasoning by covering at least two of the topic areas in the guidance below. Overall, at least four valid points must have been made which can relate to any of the topic areas in the guidance. | 4-6 |
| 1 | A few relevant points have been made but there is no evidence that a line of reasoning has been followed. The points may only relate to one or two of the four areas from the guidance or may be made in a superficial way with little substantiation. | 1-3 |

**Guidance – Indicative Response**

**1. How it was possible for data to be collected**

WiFi signals can travel outside of property // over wide area // limited control over range

Any WiFi receiver in range can read the data packets **NE**. The receiver in the car can read the packets

No need to physically “tap” into a WiFi connection, unlike a cabled connection

A protocol that does not encrypt the transmissions may have been used // unencrypted data sent. **NE**. Network not secure

**2. Steps to prevent**

Use a protocol that encrypts data transmissions

**A**. Encrypt the transmission

**R**. Password protection

Example of secure protocol eg WPA, WPA2

Disable broadcast of SSID to make network harder to identify (Note: Accept this point even though the SSID would be in other data packets)

Limit power of transmitter so data does not travel outside premises (although in practice this might be hard to achieve)

Use cabled network instead of WiFi.

**R**. MAC address filtering (as cars were not connecting to networks just intercepting transmissions)

**3. Legal and ethical issues**

If the data is being transmitted through the air, who does it belong to, if anyone? // Should data transmitted by WiFi be treated like a broadcast (eg TV) or a private communication (eg telephone call)?

Is it wrong to intercept data if people freely choose to transmit it wirelessly? **A**. Is it ethical to collect data from people without their permission?

Is it legal to intercept data if people freely choose to transmit it wirelessly? What laws apply in this scenario? Is this really hacking?

Are the ethics or laws different for intercepting data transmitted wirelessly than by cable?

Is there a difference between collecting statistical data eg channel number, signal strength, SSID and collecting the payload data?

Was the data just collected or was there an intention to process it as well?

What should the company have done when it realised that the data had been collected? // Should the data have been immediately deleted, or kept so that the company could contact and apologise to people it had collected data from? // What should be done with the data now?

What should the company have done if it inadvertently discovered evidence of illegal activity in the collected data?

Legality/ethicality may depend on the nature of the data gathered // (In the UK) would some of the collected data count as “personal data” (under the Data Protection Act) // could some of the data have been sensitive (accept example eg bank account details, details of minors) **NE**. Data may be private

To what extent is the company financially liable for collecting the data? Or any consequences of its use?

Could the legal situation be different in different countries where the company operated?

Was the collection of data intentional or just an accidental side-effect of a reasonable process?

What was done to ensure (existing) policies are followed?

Should there have been more oversight of code development?

Could intellectual property have been inadvertently stolen?

Is it ethical to collect/store information secretly from people // without them knowing?

Is it ethical to collect data if there is no (legitimate) purpose for doing so?

Were the developers in breach of their contracts with the company / company guidelines?

*Relevant Legislation*

Students may name specific pieces of legislation that could have been breached as part of their response. Determining whether or not a breach has actually occurred would probably require more information than is provided in the question and detailed knowledge of the legislation, which is not required by the specification. Therefore, up to **two points** can be given for students naming relevant pieces of legislation that could have been breached, regardless of whether or not this can be ascertained with certainty. Relevant pieces of legislation include:

•   The Data Protection Act

•   The Computer Misuse Act

•   The Regulation of Investigatory Powers Act

•   The Communications Act

Points should be given for assertions that legislation has definitely been breached, even if this is only a possibility in the context rather than a certainty.

Responses that reference other legislation should be referred to Team Leaders.

**A**. As an alternative to naming the Data Protection Act, a response could instead question whether privacy laws have been breached, or if a breach of privacy has occurred.

**4. Lessons**

Improved training for developers in what is legal / ethical (accept company needs to improve understanding of legal/ethical issues)

Need to review guidelines that developers are expected to follow

Need for scrutiny of code / supervision by people outside of development team

Developers could be required to check each other’s code

Developers could be required to log changes made to code and reason

Should only collect data that is absolutely necessary // that has a clear purpose // need to review collected data to see why it is being collected and stored // need to fully consider the purpose of any data collection before doing it

Could/should remove equipment for Wi-Fi data capture used in cars to collect mapping data.

**NE**. Further testing should be carried out unless there is a clear explanation of the mechanism by which testing will check that the software has no additional functionality is described eg inspection of collected data files to verify purpose of contents

**[12]**

**Q4.**

(a)     1. a mechanical / moveable structure;

2. can sense its surroundings / environment;

3. can manipulate things// interact with things;

4. makes dextrous coordinated movements;

5. has some degree of intelligence or ability to make choices based on environment;

6. is programmable // controlled by a computer system;

7. a mechanism guided by automatic controls // autonomous operation;

8. a machine that replaces a human being and performs various tasks of a human being // can operate in places / situations humans can not;

9. a device that automatically performs complicated / repetitive tasks;

10. a mechanism which reacts to its environment;

11. capable of consistent application / precise movements;

12. Should obey Asimov's laws // A robot may not injure a human being // allow a human being to come to harm;

**MAX 2**

(b)

|  |
| --- |
| **Marking** |
| 0 marks | student makes no valid points |
| 1 mark | student makes a valid point |
| 2 marks | student makes two or more valid points but these are not developed or connected |
| 3 marks | student makes at least two or more valid points that are connected and leads to a final opinion |

The following is a collection of examples that students could use to support their opinion.

YES:
Programs have been developed to mimic ‘intelligent’ behaviours such as playing chess;
Technology is moving on at a very fast pace;
AI research has shown that computers can ‘learn’;
Research into how the brain works is continuing to reveal new insights;
Evolutionary algorithms // adaptive algorithms // computer can modify their own programs;
Computers are getting closer to passing the Turing test (which is a test for intelligence)

NO:
Computers cannot learn to the same extent as humans and therefore cannot demonstrate intelligence;
Computers lack emotion / feelings / instinct / creativity;
Computers find it hard to cope with unexpected situations / work well only in a structured environment;
Hard to actually state / define what intelligence is;
No computer has passed the Turing test (even though this has been around for a long time) // due to the Chinese room / box argument;
Theological / existential reasons // intelligence can only be bestowed by a God;

**Note:** marks can be awarded for other valid statements - refer to team leader for discussion

**MAX 3**

(c)     (i)      a person who breaks through some security systems to gain access to a computer system;

**1**

(ii)     Computer Misuse (Act);

**I** year

**1**

(iii)    a global crime as criminals can easily be in another country;
use of botnets means that computers used are separate from and do not belong to the criminal // hacking might be routed through multiple computers // use of public computers / wifi;
use of IP spoofing //changing / dynamic IP address // use of proxy / vpn;
companies rarely wish to report that they have been hacked // bad publicity;
often difficult to detect that a crime has been committed // no physical / biological evidence;

***Any other good reason - refer to team leader if in doubt.***

**MAX 2**

**[9]**

**Q5.**

(a)     **1** ;

4 ;

3 ;

**3**

(b)     (i)      Optical Character Recognition;

**1**

(ii)     Data that can (uniquely) identify a living person;

**1**

(iii)    *Linked to context*: **(MAX 2)**

Data could be used to track location (and activities) of a person;

Data links a person to a specific location and car at a (specific) time;

Number plates might not be recognised accurately (suggesting, incorrectly, a car was at a particular location);

*General points*: **(MAX 1)**

Concern over security of data storage / / security of data might be at risk;

Selling on of data;

Data used for marketing / / unwanted phone calls;

**MAX 2**

**[7]**

**Q6.**

(a)     Data Protection (Act);

**1**

(b)     Data should be kept securely;

**1**

(c)     Data should be fairly and lawfully processed;
Data should be obtained for specified and lawful purposes. (**A** Data should be processed for limited purposes);
Data should be adequate, relevant and not excessive;
Data should be accurate // kept up to date;
Data should not be kept longer than necessary;
Data should be not transferred to other countries without adequate protection;
Data should be processed in accordance with the rights of the data subjects.

**Max 1**

(d)     That data is not being encrypted // data is not being sent securely // that hackers might be able to see personal data;

**A** the protocol / it is not secure
**R** website not secure

HTTPS // HyperText Transfer Protocol Secure;

**2**

(e)     Word processor : General purpose (application software);
Parent portal : Bespoke;
Web server : Special purpose (application software);

**3**

**[8]**

**Q7.**

(a)     Copyright, Designs and Patents (Act);
**A** Digital Economy Act

**1**

(b)     No money goes to the artists / publishers / distributors;
The quantity/amount of music being produced could go down;
(Pirated) music can be of a lower quality;

**Max 2**

(c)     Can sell on items that have been purchased;
Can play on any suitable device // Can be played on many devices that the purchaser might own;
Can make backup copies;
Can play without any time limit// no limit on amount of plays;
Can load into any suitable software package;
Encourages creativity / sharing / remixing / reworking;

**A** user has full control over their music

**Max 2**

**[5]**

**Q8.**

(a)     (i)      To manage / control / execute commands on a remote machine;
**A** remote access / login
**A** a clear example of remote management
**NE** remote viewing
**R** remote desktop

**1**

(ii)     Enable files on one host / computer / client to be copied to another host / computer / server;
To manage files on a remote computer / server;
**A** to upload / download / transfer files
**NE** “sharing”
**NE** load a file
**NE** transfer data

**1**

(iii)     To retrieve / fetch (stored) email;
To check for new emails;
**A** access / download / receive
**R** sending
**TO** any mention of sending
**NE** just “email”

**1**

(b)     (i)      192.168.3.205 // 74.125.4.148 // 208.43.202.29;

**1**

(ii)     80 // 25 // 58539 // 57458 // 57459;

**I** colons

**1**

(iii)     192.168.3.205:80 //
192.168.3.205:25 //74.125.4.148:58539 //
208.43.202.29:57458 // 208.43.202.29:57459 ;

**1**

(c)     Servers might be in another room / site / cupboard / inaccessible ;
Servers might not have a keyboard / monitor installed ;
Can manage multiple servers from one machine;
Servers can be managed outside of work hours / from anywhere;
It would be quicker (**A** more convenient) (to manage from her machine than visit the servers) // better time management;
Server rooms are often uncomfortable places for people to work in;

**NE** she does not need to go to the servers

**Max 2**

**[8]**

**Q9.**

(a)     **Legislation**Health and Safety (Regulations);
Display Screen Equipment Regulations;

**Affect**Monitors should be moveable / adjustable to alter height / reduce glare / minimize flicker;

**A** top of screen at eye level

Chairs should be moveable / adjustable;
Position of mouse/keyboard assessed // keyboard should be separate from screen;
Consideration of lighting;
Space under desk for legs;
Supply a foot-rest / wrist-supports;

**A** feet should be touching flat surface

Set up software to use readable fonts // select colours that are easy on the eye;
Cables should not be left loose;
Sufficient workspace around computer;

*Max 1 mark for legislation
Max 2 for affect*

**3**

(b)     (i)      Copyright, Designs and Patents (Act) ;
**R** Copyright

**1**

(ii)     Number of licenses the library has;
If the software needs a license;
Type of license the library has;
Library has a site-wide license;
Check that software can (legally) be used on more than one machine;
**A** its terms of use

**Max 1**

(c)     Contract/rules/regulations that an employee must follow // a member of an organisation is bound by;
**NE** agreement/terms
**R** Laws alone instead of rules

Contents of a code (may) not be legal requirement;
Breaking rules could result in disciplinary action/possibility of losing job;

**Max 1**

**[6]**

**Q10.**

(a)

|  |
| --- |
| **Purpose** |
| To distribute commercial software |
| To store a 20GB high definition movie file |
| To use for a 3GB archive of a school server |
| To create a copy of a music album |

*Note: Mark first occurrence of each medium*

**4**

(b)     **Write**:
To write data a high powered / high frequency laser makes sections less reflective / burns a pit;

**R** laser writes grooves/tracks;

**Read**:
A low powered laser is used to read data back from the disk;

**Mechanism**:
The difference between reflective and non-reflective parts / pits and lands indicates the 1s and 0s;
The data is stored as a continuous spiral track;

*One mark each for write, read and mechanism.*

*Note: a laser is used to read and write data (1 mark only)*

***Max 3***

(c)     No hardware exists to read CD-R disks;
The CD-R medium has become corrupted // CD-R is scratched / damaged / degraded;
Support for file format no longer available // no software capable of reading format data stored in CD-R;

**Max 2**

**[9]**

**Q11.**

Exactly same operation performed over and over again by programmed robot sprayer;
Position of car bodies predetermined//car bodies in known precise positions all the time// Robot sprayer does not need to deviate from pre-programmed position at any time // a strictly controlled environment;
Actions to be performed known in advance for programmed robot sprayer;
Programmed robot sprayer requires only limited sensing of environment if any // fewer inputs to monitor;
Robot sprayer does limited processing;
Robot sprayer has a relatively simple program which is numerically controlled;

Car system has to continuously monitor many external variables;
Car system has to perform very complex processing;
Car system will need very powerful processors;
Car system will need a range of sensors;
Car system has to analyse/react to an input very quickly (and then adjust one or more of the three given outputs to alter car motion);
The environment in which the car operates is not predictable//is more complex//has greater uncertainty;
Car system needs to know at all times exactly where it is;

Candidate may answer by example, e.g.
Car system cannot be programmed in advance to know where all pedestrians will be at any one time //
Car cannot be programmed in advance to know where all other moving cars will be at any one time //
Car system cannot be programmed in advance to know where all stationary obstacles such as parked cars will be//potholes at any one time;

*Note: For full marks candidate must cover both problems*

*Max 4*

***[4]***

**Q12.**

(a)     Copyright Design and Patents Act (1988) // Copyright and Related Regulations (2003) // Digital Economy Act (2010);
**NE** Copyright, Copyright Act

**1**

(a)     Encrypt the music file;
A (decrypt) key is needed for playback; **R** code, PIN, password for key
Download server keeps records of authorised clients (hardware devices) allowed to decrypt music; R tied to IP address
Playback tied to a particular (set of) hardware device(s);
**A** Using a digital watermark in the music file a form of steganography;
**R** cannot be transferred to other devices
**NE** “player” for “device”

**Max 2**

**[3]**

**Q13.**

**Good at:**Can make precise/accurate / complex calculations / actions;
**NE** “good at maths / logic” – need the concept of complex
More consistent than humans;
Repetitive tasks;
Can work in conditions too dangerous for a human;
Working with large volumes of data;
Fast processing of data / calculations;
Can perform task without breaks / / for longer than humans;
**R** don’t get bored

**Bad at:**Image recognition;
Shape detection;
If the conditions change they adapt poorly / / not very adaptable / / learning;
**A** “can’t think for themselves”
Poor at coping with emergencies / unexpected circumstances;
Creativity / / invention / / lateral thinking;
Bad at discriminating;
Processing qualitative data;
Recognising human concepts e.g. emotion;
**A** Cannot recognise when it makes mistakes;

*Above are exemplars only. Award credit for other valid points.*

*Max 3 if all points are about just good or just bad.*

***[4]***

**Q14.**

(a)     Name or description of any task that is likely to be completed by a robot;

**1**

(b)     Task is repetitive / monotonous;
Precise movement required;
**A** accurate movement
Consistent task completion;
Robot gives increased productivity / faster than human;
Task is unpleasant;
Task is dangerous/improved safety/reduced risk to humans;
Robot able to operate in environment human could not work in;
Continuous operation;
**R** humans get tired / need a break
Cost effective in the long term;
**R** cheaper, “no wages”
Response must be valid within context of task named in part (a)

**Max 2**

**[3]**

**Q15.**

**Arguments for DRM:**Protects *copyright* // makes it harder to breach copyright/pirate works / restricts sharing the music;
Ensures creators/suppliers receive payment for work;
Preserves incentive for people to develop new works / promotes continuation of business;
Facilitates online rental service;

**Arguments against DRM:**Restricts the potential audience;
Content difficult to access as encrypted;
Makes it difficult for purchasers to make legitimate copies / backups;
Prevents use on multiple devices // tied to one or a small number of (hardware) devices;
Ineffective at preventing copying / example of why ineffective;
Can restrict playback of music to particular software packages / competing systems incompatible;
May be unable to listen to music if company ceases to exist / relies on company continuing to exist / unable to listen if can not authenticate copy // unable to listen if NO Internet connection;
Does not deal with expiry of copyright period;
Limits creativity / limits collaboration in creating content;

*To achieve a mark in this band, candidates must meet the subject criterion (SUB) and 4 of the 5 quality of language criteria (QLx).*

|  |  |
| --- | --- |
| *SUB* | Candidate has provided a balanced argument for and against DRM (**at least two points on either side**) , making at least 5 distinct points. |
| *QL1* | Text is legible |
| *QL2* | There are few, if any, errors of spelling, punctuation and grammar. Meaning is clear. |
| *QL3* | The candidate has selected and used a form and style of writing appropriate to the purpose and has expressed ideas clearly and fluently. |
| *QL4* | Sentences and paragraphs follow on from one another clearly and coherently. |
| *QL5* | Appropriate specialist vocabulary has been used. |

**5–6**

*To achieve a mark in this band, candidates must meet the subject criterion (SUB) and 4 of the 5 quality of language criteria (QLx).*

|  |  |
| --- | --- |
| *SUB* | Candidate has made at least three points. Additionally, to get four marks, **there must be at least one point on each side** of the argument. |
| *QL1* | Text is legible |
| *QL2* | There may be occasional errors of spelling, punctuation and grammar. Meaning is clear. |
| *QL3* | The candidate has, in the main, used a form and style of writing appropriate to the purpose, with occasional lapses. The candidate has expressed ideas clearly and reasonably fluently. |
| *QL4* | The candidate has used well-linked sentences and paragraphs. |
| *QL5* | Appropriate specialist vocabulary has been used. |

**3–4**

*To achieve a mark in this band, candidates must meet the subject criterion (SUB). The quality of language should be typified by the QLx statements.*

|  |  |
| --- | --- |
| *SUB* | Candidate has made one or two relevant points.The answer may be one-sided. |
| *QL1* | Most of the text is legible. |
| *QL2* | There may be some errors of spelling, punctuation and grammar but it should still be possible to understand most of the response. |
| *QL3* | The candidate has used a form and style of writing which has many deficiencies. Ideas are not always clearly expressed. |
| *QL4* | Sentences and paragraphs may not always be well-connected or bullet points may have been used. |
| *QL5* | Specialist vocabulary has been used inappropriately or not at all. |

**1–2**

Candidate has not made reference to any of the points listed above.

**0**

*Note: Even if English is perfect, candidates can only get marks for the points made at the top of the mark scheme for this question.*

*If a candidate meets the subject criterion in a band but does not meet the quality of language criteria then drop mark by one band, providing that at least 3 of the quality of language criteria are met in the lower band. If 3 criteria re not met then drop by two bands.*

***[6]***

**Q16.**

(a)     (i)      Copyright, Designs and Patents **A** Copyright

**1**

(ii)     Computer Misuse

**1**

(iii)    Health and Safety at Work **A** Health and Safety

**1**

(b)     (i)      Rules that an employee must follow//a member of an organisation is bound by;
**NE** agreement
**R** Laws alone instead of rules
Usually a (written) document/contract;
Contents of a code (may) not be legal requirement;
Breaking rules could result in disciplinary action/possibility of losing job;

**Max 2**

(ii)     To set out points of good practice for employees//set out rules that are not legal requirements;
To ensure employees are aware of legal requirements//as employees may not know what the law is;
To relate legal requirements to the work that the employee does;
To make clear consequences of breaking the rules *if mark not already awarded in b(i)***A** to exonerate the company if law is broken

**Max 2**

**[7]**

**Q17.**

(a)     Data that relate to a living person // individual who can be identified from that data;
**NE** Data that belongs to / relates to a person

**1**

(b)(c)

|  |  |
| --- | --- |
| **Principle** | **Appropriate Feature** |
| Data must be accurate and up todate.**A** accurate without up to date orvice-versa (**A** correct foraccurate) | Validation / examples of avalidation method;Verification / example of averification method;Store date when data last updated;Alert user when data is older thanspecified age; |
| Data must not be kept forlonger than is necessary. | Password / card / biometric to logon;Encryption;Backup;Different types of user / users have different rights;Automatic logoff if left unattended;Other appropriate security method; |
| Data must be processed in linewith the rights of data subjects. | Option to flag customer as notaccepting direct marketing;Option to edit or delete data;Option to print copy of all datafor customer to see; |
| Data must be kept securely //Prevent unauthorisedaccess / disclosure of data**NE** Hacking | Records deleted automaticallyafter no contact with customer forfixed period;Option to delete data; |
| Data must only be processed forregistered / lawful purpose | Input of data subject preferencewith regard to use of/transfer ofdata;Restrictions on exporting datafrom package; |
| **A** Data must not be transferredto other countries withoutadequate protection. | Restrictions on exporting datafrom package; |

*1 mark for* ***principle****1 mark for* ***naming feature*** *that is appropriate to the principle stated
1 mark for appropriate* ***explanation of how*** *the feature will help the company comply with the DPA***R** Other DPA principles
*Mark can be awarded for principle if no feature stated or if feature inappropriate.*

**3**

**[4]**

**Q18.**

(a)     **What**:
Access management system for digital media;
Method of encrypting digital media;
Media can only be read/used/accessed with correct key;

**Why**:
To enforce copyright law // Protect intellectual property;
**A** Prevent criminal offence
**R** Just illegal
To stop people copying music (without permission)/prevent piracy/prevent illegal sharing/prevent illegal downloads;
**R** stop reselling
To ensure company/artist receives income from sales of music // does not lose money;

*Max 2 for what, max 2 for why, max 3 overall*

**3**

(b)     Music/files are encrypted;
**R** Encoded/Scrambled for encrypted
User obtains key when purchases track/file;
Music/files must be decrypted with key;
**R** Password, Code
Key may only work on computer file downloaded onto;
**A** Playback tied to particular hardware device/group of devices
**R** Files cannot be copied
Key may need to be authenticated with server over Internet whenever file used // Company may have licence/key server;
Time lock so music will not play after certain date // only play a fixed number of times;
Use of a specific/proprietary program to play music;
Usage rights may be expressed in a Rights Expression Language;
**R** Streaming;

**Max 2**

**[5]**

**Q19.**

(a)     (i)      **Unauthorised access**

Password protect sensitive files;

//have username & passwords to log on;

/ have username & password / use biometrics to restrict access;

*1 mark*

***AND***

*Change passwords on a regular basis;*

*/ choose passwords that are difficult to guess;*

*/ do not write passwords down;*

*/ shut down after (e.g.) 3 attempts at guessing the password;*

***A*** *and set attributes/permissions/access rights;*

*1 mark*

//Set attributes/permissions/access rights;

*1 mark*

**AND**

To restrict access to specific users or groups of user;

*1 mark*

//Use biometrics /lock doors to rooms where terminals are

/employees log off / lock machines when they leave them;

*1 mark*

**AND**

To restrict access to sensitive files to certain terminals;

*1 mark*

// encrypt (sensitive) files;

*1 mark*

**AND**

Only authorised users have (decryption) code/key;

*1 mark*

(ii)     Use software that can monitor /log user activity

**A** record

**R** store /monitor file changes;

*1 mark*

**4**

(b)     (i)      **Data protection**

Firewall;

**A** ‘strong’ passwords

**A** Encrypt data ;

**1**

(ii)     Use up to date virus checking software;

**A** Regular backups (*if not given in iii*)

**1**

(iii)     Regular / automated backups;

/Uninterruptible power supply; (so that system can be shut down safely)

**1**

(c)     **Restore**

**A** good recovery / restore procedure;

**A** description of this

/backup media must be available immediately;

/ availability of alternative hardware;

**A** Make regular backups *if not given in (iii)*

**A** have a contract with an outside recovery service;

**1**

**[13]**

**Q20.**

|  |  |  |
| --- | --- | --- |
| Device | use | why |
| RF Remote Control | User can switch appliances/lights on (and off from a distance) // open/close doors/curtains; | does not have to be in line of view; (as with an infra-red device) |
| Movement Detector | Lights could switch on as user is approaching a new area // Doors could open on approach; | would be difficult for a wheelchair bound person to reach the doors/lightswitch; |
| Voice recognition system | To open/close doors/curtains // activate lights; | User could speak commands rather than pressing buttons // Don’t have to reach button; |
| CCTV | See who is outside/rang the doorbell; | Without going to the door; |
| Fingerprint door locks | To control who gets through the front door // to lock/unlock front door; | without needing a key; |
| Climate control system | to get fresh air // control temperature in house automatically; | No need to open windows // no need to adjust air con/heating manually; |
| Motors to operate doors/curtain rails | Can control opening/closing of garage door/door/curtains; | would be difficult for a wheelchair bound person to reach the doors/curtains; without the use of manpower; **A** for client to move around more easily; |
| Switching Unit | To switch on motors for curtain rail when it gets dark/ at certain times of day // to program the switching on of lights/heating/multimedia system/ according to times of day/week ; | Automates daily/regular activities so less to do manually; |

C/F or C/B between ‘Use’ and ‘Why’

Note: ‘would be difficult for a wheelchair bound person’ on its own NE. Needs context of use.

*2 marks max for each explanation*

**[6]**

**Q21.**

(a)     **Social;**

Some people get so many junk e-mails/ spam take up so much space;

That they have to change their e-mail address;

That legitimate e-mails get submerged by them;

Service degrades;

//Some ISP’s spam filters;

Reject legitimate e-mails;

// unkind / spiteful/ gossip type e-mails;

Can be spread about a work colleague / ex ‘partner’;

*Max 2*

**Economic**

Wastes resources;

Dealing with junk e-mail;

// corruption /damage to software and data;

From viruses carried by spam;

//many spam are fraudulent;

People pay for things that never arrive;

// ISPs have to pass on the cost of extra bandwidth;

To their customers; (Spam slows down Internet)

//people with dial-up connections

/ who receive e-mails on mobile phones;

Have to pay to download the junk mail;

Cost of;

Spam filters;

*Max 2*

**Ethical;**

People / vulnerable adults upset by;

Obscene / inappropriate e-mails;

Phishing e-mails;

Extracting personal /financial information;

*Max 2*

**A** ethical - social, economic - social cross over where valid, but points must be different.

**6**

(b)     Have more than one e-mail address;

Use a spam black-list to refuse e-mails from known spamming sites;

Use a spam filter in the e-mail software / in house;

Careful choice of e-mail address;

**1**

**[7]**

**Q22.**

(a)     **Copyright (not license) is**

The (economic) right of the writer / vendor of software to control the use / availability of their material;

**1**

(b)     **A purchaser can legally:**

Install / Run the program on a computer;

// Run the program on the number of computers specified in the license;

**A** Make a single copy for back-up purposes

**A** Use it for personal use

**1**

(c)     **A purchaser cannot:**

Make a copy (to give to a friend);

Run it on more computers at once than you have a license for;

*(accepted as different from above if specified clearly*)

Copy and sell the software;

Convert the program into another computer language;

Transmit it (over a telecommunications line);

Reverse engineer it;

**R** rent it, lend it

*1 mark per point to a maximum 2*

**2**

**[4]**

**Q23.**

(a)     *1 mark for one* ***benefit*** *to each of (i), (ii), (iii) to max:*

(i)      **UK Universities:**

Economic – can charge realistic (i.e. more than for British students) fees to overseas students;

Economic – generate more revenue by enrolling more students;

Economic – they feel they need to as their competitors are /it threatens their client base;

Economic – ease with which material can be updated;

Economic – can expand without providing more buildings / reduced staffing because on - line;

**R** fewer lecturers

Economic / Social – world-wide publicity / respect;

Social – seen to be inclusive of e.g. people who cannot study full time;

(ii)     **Students:**

Social – different time zones no problem œ can study at any time of day;

Social – can continue the course even if they don’t stay in one place long enough;

Economic – no travel or accommodation expenses / can live at home;

Economic – can fit study round other commitments such as work;

(iii)     **Businesses**:

Economic – can attract and keep the best staff with the promise of further good qualifications;

Economic œ More effective / skilled / knowledgeable / motivated workforce possible;

Economic – employees can apply their learning to their work immediately;

Economic – training of employees can be done at times convenient to the business;

**3**

(b)     **Hardware*:***

Modem / cable modem ;

ISDN line / ADSL Line ;

*1 mark*

***Software:***

*Browser;*

*Communication software / dial-up software;*

*Online teaching software;*

*Discussion forum / bulletin board software;*

*Telnet / ftp software / remote access software;*

***R*** *IE / Netscape etc.*

*1 mark*

***2***

***[5]***

**Q24.**

(a)     (i)      People listening to audio CD often want to know the title of the track without having to look this up on CD cover;

Additional information not recorded on CD cover may be available from on-line database;

User can get e-mails promoting products that user likes;

User may get sent information related to interests;

Filtered information can be sent to user based on user’s interests;

**1**

(ii)     Could gain statistics based on user interests;

Could expand product line to cater for users’ interests

(generating more revenue);

Could mean lower marketing costs for company because marketing is targeted;

Could mean cheaper audio CDs because company spends less on marketing (leading to more sales);

Could mean discounts on audio CDs for listener leading to more sales);

Marketing information can be sold on;

**A** Targeting related to costs/revenue answers

**R** could sell more CDs unless justified with a response that maps onto above

**R** Marketing can be targeted **R** Can detect piracy **R** Costs alone

**1**

(b)     Invasion of privacy//user isn’t aware of this taking place;

Computer owner’s permission to link e-mail address to digital fingerprint not obtained;

Permission to place digital fingerprint on user’s computer not obtained;

Because users may not want their tastes in music to be known;

**1**

**[3]**

**Q25.**

LAN;

Justification:

Computers in health centre are in close proximity to each

other/geographically close/in same building/on same site;

**R** Computers within health centre on its own

**[2]**

**Q26.**

(a)     International transfers span different time zones;

Messages may get lost otherwise;

Transfers may be batched for transfer overnight;

**Max 1**

(b)     To prevent fraud;

To prevent changes to the message going undetected;

To prevent changes to the content of the message;

To prevent message being understood or information gathered;

**R** To prevent a message being read….......

**Max 1**

(c)     N.B.Emphasis is on government monitoring banking transfers for something illegal

To make it possible for agents of the government to learn of money transfers made by criminals;

To make it possible for agents of the government to learn of money transfers made by terrorists;

**R** So government can monitor messages/e-mails.

**Max 1**

**[3]**

**Q27.**

(a)     *Any two reasons × 1 each*

To monitor criminal activity; (accept two different types of each category)

(**A** Anything that maps onto criminal activity, e.g. pornography)

To monitor terrorist activity; (accept two different types of each category)

To monitor political groups; (accept two different types of each category)

**A** To monitor for viruses which threaten economic wellbeing of country or have a criminal intent;

**2**

(b)     One way: encrypt content;

**A** encode/send in code

**1**

**[3]**