

# NETWORKS

## TUTORS

These notes are designed to assist teachers of the course and are in a condensed format. Teachers should also consult the syllabus for this module and adapt these notes accordingly by using extra examples and by filling out this material with detail. Students will be expected to apply the material in a BUSINESS environment and with reference to the particular situation specified in the examination question. Repeating these or any other notes in a generalised form is unlikely to satisfy the required answers for any question.

## LOCAL AREA NETWORK (LAN)

- occupies a single site
- private – no access from outside
- connected by cables

## WIDE AREA NETWORK (WAN) – sometimes called LONG HAUL NETWORK (LHN)

- connected by telephone lines or communication links/satellite
- requires the use of modems
- may need a front-end processor/multiplexor to manage many lines

## ADVANTAGES OF NETWORKS

- security of ALL data can be planned and controlled from a central position – however, violations of security (e.g. virus) can affect all terminals instead of just one. See Notes for Information Processing for differences between security and privacy.
- data files can be shared across many users
- data access can be restricted on a “need to know” principle with different levels of access granted for different users – from users permitted to see only some files in read-only mode up to read and amend all files
- peripherals can be shared – a single high quality printer (laser) can be shared instead of each terminal having its own, probably cheaper printer
- software can be standardised – one copy can be shared – cheaper network licences for software than for copies on each terminal
- central control of total work in the system
- access to all files possible from any terminal
- group working is possible with different terminals working on the same application at the same time – e.g. several users keying in different data related to the same application.
- email between terminals

## DISADVANTAGES OF NETWORKS

- possible security risk with data – a single machine would limit the problem to certain data
- requires careful planning, control and installation
- excess use of the email system for private messages between employees

## NOTES:

1. Candidates must recognise that in general data is NOT sent between terminals but is saved on a central server for other users to access when they need that data. This would not apply where a network does not have a server.
2. In previous examinations, candidates have been asked to discuss the advantages of upgrading a room of stand-alone computers to a LAN. This is a change of configuration and does NOT require purchase of new computers nor does it have any bearing on WANs.

## DEFINITIONS

**Synchronous** – high speed communication where clocks at each end are synchronised with clock pulses

**Asynchronous** – communication where there is not synchronisation of the clocks at each end. Start and stop bits signal when data begins and ends.

**Baud Rate** – maximum transfer rate of data measured in bits per second.

**Bandwidth** – **a physical limitation caused by limiting the range of frequencies in which data can be sent. Higher bandwidth will result in faster transmission but will be more expensive to implement.**

**Modem** (Modulation/Demodulation)– convert signals between from binary (in the computer) to analogue (for the telephone line). There will be a modem at the other end to convert the signals back to binary in the receiver's computer.

**Multiplexor** – is a “switchboard” enabling many communication lines to be handled through one computer connection. The various incoming lines use a **round-robin polling system** where each line is checked in turn see if a message is coming in. A similar process is needed for messages being sent out from one computer system to many lines. Use of a multiplexor requires a wide bandwidth but it reduces line charges. (See below)

**ISDN** (Integrated Services Digital Network) – is a connection for high bandwidths and handles digital signals without the need for a modem. Access to the internet and making a telephone call is possible on the same line at the same time.

## **DATA TRANSMISSION - MODULATION and MULTIPLEXING**

A **carrier** wave with a FIXED high frequency can be used for data transmission.

**amplitude-modulation** – To Send a “1”, the amplitude of the wave is larger than when a “0” is sent. (Figure 1 below)

**frequency-modulation** – Here the frequency of the carrier wave varies to distinguish between the 0 and 1 bits. Higher frequency represents the “1”. Figure 2 below)

\*\*\*\* Figures 1 and 2 in here \*\*\*\*\*

To send more than one signal along a line at the same time (**multiplexing**). There are two main methods by which a multiplexor works.

**FDM** (Frequency Division Multiplexing) – The bandwidth is divided up between the signals so that different signals are transmitted on different carrier waves at the same time but with different frequencies.

**TDM** (Time Division Multiplexing) – Each signal is given a short burst so that it appears that all are being sent at the same time.

**OPEN SYSTEMS** - A frameworks or theoretical architecture for networks expressed in 7 layers comprising hardware and software and conforming to internationally agreed standards. The logic order (from basic to user) is:

**Physical** – are the electrical / mechanical connections which join the receiver to the sender. No software is involved.

**Data Link** – is responsible for the transfer along one link in the network including any synchronisation needed and error checking.

**Network** – deals with switching and routing the data so that other networks can be connected.

**Transport** – controls correct delivery of completed messages between nodes and deciding the most appropriate route. It also decided the size of the data transmitted and provides some error checking.

**Session** – controls the logical connection between systems including synchronisation. It also deals with permissions for data transmission.

**Presentation** – resolves any data encoding differences that might occur between the sender and the receiver's system,

**Application** – gives the standards for the application system such as message handling and file transfers. Software can be written to deal with this such as for database accesses.

## NETWORK CONFIGURATIONS

**Ring** – All terminals are connected in a circle. There may not be a server in the loop. Messages can travel in either direction using "packets" of fixed size. Each packet holds the source and destination terminal addresses with a small part of the total data being sent. Although packets pass through other terminals to reach the receiver, only the receiving terminal can access the data because only it has the correct terminal address. The only option on route of a packet is clockwise or anticlockwise. The speed of transmission is reduced if one terminal is out.

**Repeaters** boost the message on from one terminal to the next.

**Star** – A central server known as the **hub** is connected to each terminal. Communication between terminals has to pass through the hub. There is no loss of performance if one terminal is out other than the fact that other terminals cannot communicate with it. This is an expensive when many terminals are connected. This configuration provides fast communication with terminals. Bandwidth is less important because each connection is only between hub and terminal.

**Bus** – This is suitable for long drawn out layouts as each terminal is connected off the main channel. It is the cheapest to install and the server is one of the stations on the line. A terminator is needed at the end of cable to "reflect" the signal. This configuration can be slow when many users are sharing the same links. If the bandwidth is widened, the speed will improve. Possible security issues as communications pass through machines to reach their destination.

#### NETWORKS IN BUSINESS (Compared with STAND-ALONE computers)

- Business transactions can be recorded at source (where the data is generated) e.g. supermarket checkout → accurate costing and "Just-in-time" reordering of stock.
- Business can be managed remotely and performance measured
- Data can be shared across sites. e.g. different shops in the same chain
- The data is up-to-date
- There is less internal movement of people and files
- Provides a central fully accessible systematic filing system
- Share peripherals – one good printer instead of many cheap but clearly not appropriate for WAN
- The cost of hardware has fallen and network terminals do not need all the powerful features of a stand alone. e.g. printer, diskette drives
- Email communications between departments enable messages to be sent even if the receiver is not available. Message can also be distributed to many people and received at any terminal.
- There is less data redundancy because data stored once is the same for all who access it.
- Simultaneous access of the same data is possible. See **locking** in Notes for Hardware and Operating Systems.
- Any terminal can deal with any query (customer ?) meaning the business becomes an integrated function.
- However viruses are more likely
- AND time can be wasted with trivial personal emails passing between users.

#### EXAMPLES OF USE

- A Delivery company (and its customers) can track the progress of a parcel throughout its journey → Greater satisfaction to customer.
- Supermarkets provide customers with fast checkout, detailed receipts, accurate pricing and a lower likelihood of stock running out.

#### CONNECTING TO THE INTERNET

**Internet Service Providers (ISP)** provide a service to user giving them access to their computer system and then into the Internet. The internet is open to all. ISP controls access to accounts and routes incoming and outgoing emails. It stores incoming emails awaiting collection.

The ISP may offer a range of facilities at varying costs:

email – possibly several addresses on the same account

file space – to store messages and files on their server

browser – for looking through the web pages

newsgroups – access

software – creation of own web sites or automatic rectification of access problems

technical support – to overcome ongoing problems  
speed of access – **broadband** for fast access or **ISDN** (see above)  
registration – online now but by free CD-ROM in the past

**Intranet** – is a closed network created for an organisation but accessed through the normal internet. It behaves as a “multi-site” LAN. Clearly there needs to be extra security that would not be needed with a LAN, to prevent outside hackers gaining access to data belonging to the organisation.

**Domain Name** – is the name needed for a LAN or individuals to be connected to the internet e.g. icm.ac. The web actually uses an **IP address** with a format like 123.456.789.012 and this maps the domain name which are easier to remember. The four numbers, separated by full stops identify each individual user enabling routing of messages to be achieved.

## ***E-MAIL***

Users must have a telephone line and register with an ISP. This can be achieved on-line by accessing a web site, by installing through a CD-ROM available free from different outlets or by contacting a telephone company directly. Some software will be installed. Registration gives the user an address of the format A.B@C.D where C is the ISP and D might be COM, NET ..etc. B is main user name and A is a separate descriptor – different A values gives the user different E-Mail addresses perhaps within a company. No spaces (and some other special characters such as @) can be included in A,B,C or D. The user may be given a password or asked to chose one.

### NOTES:

- E-mail should always be considered in a business environment when answering examination questions unless the question states otherwise.

### TO SEND AN E-MAIL

1. Select the e-mail software. e.g. Outlook Express or Mail from Internet Explorer
2. Log in – supply address and password. Normally this then shows the **Inbox**.
3. Select Compose/Create
4. Key in the sender's address – this is usually automatic on a private computer
5. Key the receiver's address – there could be more than one if the user wishes to send the same message to several people. Sender can select from his/her address book.
6. Key a short message in **Subject** that gives the receiver an indication of what purpose of the message.
7. If the message is to be sent as copies to other recipients, type their addresses under **cc**.
8. Key a message and edit it.
9. If an attachment is to accompany the e-mail, perhaps creates in a word processing or spreadsheet program, select **Insert, File attachment** and then the file name.
10. Select **Receipt** option if a receipt is required to show that the receiver has read the e-mail.
11. Select **Send**. Sections 4 to 10 can be performed in any order before sending.

### ROUTE OF THE E-MAIL

1. Notification that the message has been sent is given to the sender.
2. Once sent, a copy of the e-mail will be saved in **Outbox/Sent**.
3. The message will pass down the communication line to the Sender's ISP.
4. It will be routed to the receiver's ISP server where it remains until the receiver logs onto his/her e-mail.

NOTE: Examination answers have often been vague or incorrect. Candidates seem to have been under the impression, for instance, that e-mail goes directly from computer to computer. How would this be possible if the receiver computer was switched off at that moment or the receiver was using a different computer from the usual one.

### ***TO RECEIVE AN E-MAIL***



There are two main uses here. A user may either be checking for

- ALL incoming e-mails not knowing who will be the senders
- a particular e-mail which the receiver was expecting.

The process is

1. Log in (as sending an e-mail - 1 and 2)
2. Select Inbox
3. Look down the list highlighted as being new ones. For a particular e-mail, the subject should make it clear. Otherwise, click on each in turn to read.
4. If e-mail has an attachment, click on the attachment icon which will then load the appropriate software to display the content.

### ***POSSIBLE ACTIONS TO TAKE WHEN SCANNING A RECEIVED E-MAIL***

- Ignore it – perhaps it has already been read or look at it later. It will remain in the Inbox.
- Delete after reading or if it is considered to be **spam** (junk mail) or it is no longer needed.
- Select **Forward** to send it to another address because the other person is the more suitable to deal with it (business) or as information for another who needs to know.
- Select **Reply** to send a message back to the sender. This usage is normally to acknowledge receipt or to answer a question posed in the original e-mail. The addresses are filled in automatically.
- Select **Save** to retain the e-mail in a different location.
- Select **Print**.

### **SIGNING CONTRACTS BY EMAIL**

Contracts can be signed and authorised within minutes under the right conditions. Legal requirements may mean that the original contract **MUST** be signed in which case e-mail cannot be used. Log in and locate the required e-mail as above

1. Click on attachment to bring up the contract
2. Print the contract
3. Sign the printed copy. Some candidates have suggested signing the contract on the screen!
4. Scan the signed contract back into the computer
5. Send this contract back as an attachment requesting a receipt.

### ***ADVANTAGES OF E-MAIL***

- Can be almost instant – **ONLY** if receiver is logged in at the same time.
- Can send the message at any time and so overcomes international time zone problems.
- Can give an immediate reply
- Produces a permanent/reference copy
- The e-mail is timed and dated
- Can be relayed to several others or more appropriate person
- Can be picked up wherever receiver is
- Cheaper than other communication methods
- Can request a read receipt.

### **DISADVANTAGES OF E-MAIL**

- People may not check mail frequently enough.
- Can waste much time with trivial messages – some companies ban e-mails on one day per week or set software barriers within a LAN.
- Can be very slow with large documents.
- Discourages face to face or verbal contact where this would be possible (LAN e-mails).

### **COMPARISON BETWEEN E-MAIL and OTHER FORMS OF COMMUNICATION**

(+) is shown for an e-mail advantage and (–) for a disadvantage

### **TELEPHONE**

## LAN

- + Receiver may not be available on telephone – out of the office or at a meeting ,
- + Can send to several people
- + No need to send physical document
- + Private – nobody can overhear, password protected
- + Cheaper – no need for a post boy within a large company
- + Can include pictures and graphic work
- + Can access on any computer
- Many junk e-mails
- Overload – In business, people tend to copy to many people, most may not need to know

## WAN (additional to LAN)

- Virus threat – need high security

## POST

### LAN

- + Guaranteed to arrive. If there are any errors such as incorrect e-mail address, the sender is notified and the e-mail can be resent.
- + A read-receipt is possible
- + Junk e-mails occur more often than junk mail
- + Much quicker response is possible.
- + Can access on any computer
- If the server breaks down, messages cannot be sent or received
- Not personal enough especially where discussion would be helpful.

### WAN (addition to LAN)

- + Much cheaper – no postal charges
- + Much quicker arrival and same-day response possible – overcomes time zone problems
- Virus threat is high

### EFT (Electronic Funds Transfer)

Money can be transferred from one bank to another without the physical movement of money.

1. The sender's bank account details are checked at the sending end.
2. This account is debited by the amount.
3. An electronic transaction is conveyed to the receiver's bank.
4. Which is then credited with the same amount.

These transactions actually occur between the bank's computer systems and not the physical locations of the bank.

#### USES:

- Payment of salaries between company and each individual employee
- Payments for goods sent and received
- Credit card payments at retail locations (EFTPOS) – EFT at the Point of Sale in supermarkets

This process saves paperwork and clerical time.

### EDI (Electronic Data Interchange)

This is compute-to-computer data transfer using an agreed format. There could be problems with compatibility of the two computer systems. Computers must be permanently on to accept data when it is transmitted.

#### USES:

- Legal documents transfer
- Supplier to and from Retail/Wholesaler - ordering systems
- Bill payments.

### HYPertext MARKUP LANGUAGE (HTML)

This is a very high level language for web design needed to conform to the data transfer protocols (see below). It has fewer commands than traditional languages and does not need to be compiled. It is a language that has to change because of the rapid changes in online requirements, but a consortium controls its standards.

## HTML FORMATS

**Tags** – These are equivalent to the directives in assembly languages which effectively give headings to different sections. Each tag is enclosed in < > with a word enclosed to explain its purpose. Where there is a need for multi-line statements, </ > is used to show the end of that section. The complete structure is composed of two parts – HEAD and BODY. The example below illustrates a simple use.

```
<HTML>
<HEAD>
<TITLE> My Web Page </TITLE>
</HEAD>
<BODY BGCOLOR = "YELLOW" TEXT = "BLACK" LINK = "BLUE"
  ALINK = "RED" VLINK = "GREEN" >
  details of the web page go in here
</BODY>
</HTML>
```

For the body of the text, colours have been selected. Black text will appear on a yellow background. The three links refer to colours of **hyperlinks** (to other pages) which show up on the web pages for users to select. "Link" colours the hyperlink not yet selected, "Alink" changes the colour when a link is selected and "Vlink" shows links selected previously. The user therefore has a visual means of identifying the various stages of his passage through the pages. The colours can be replaced by their 6-digit numeric codes. All colours are made up of combinations of red, blue and green (RGB) in varying proportions. The codes are in hexadecimal in RGB order. FF0000 is pure red, 00FF00 green and 0000FF. Varying the intensity of each colour will produce a different colour. Orange which is a mixture of red and green is FFFF00. If the red or green element is lowered, there will be slightly different hue to the colour. White is FFFFFFFF while Black is 000000.

NOTE: Candidates are not expected to be fluent in HTML but should find the above sufficient to illustrate the structure of the language. Candidates should be encouraged to look at a web site page after covering this section with a critical eye to spot these features. OTHER FEATURES include

<P> to paragraph some text, <ALIGN=left> for alignment (centre and right being alternatives), <BR> to force a new line, <B> to embolden, <I> to italicise <U> to underline, <OL> starts a list of items which will be numbered from 1 while <UL> is an unordered list which will show bullets.

Most of these will require the same command with the end marker e.g. </P>

Clearly there needs to be facilities for including

- images/pictures and held files
- forms for people to respond to the web page owner
- sound
- video

## JAVA / JAVASCRIPT

This is a language designed to work on any platform provided the computer had Java capabilities. Any new computer would now be in this position. It was originally based on the C programming language and on first sight, could easily be mistaken for C. The aim was to allow object oriented methodology. Java routines known as **applets** can be embedded into a web site by including within the tags <APPLET> and </APPLET> in HTML. For instance, a Java Applet could provide animated sequences designed for the user's requirements such as turning the page into a spreadsheet by downloading only the parts of the software which are needed. Pens of different colours could be selected for the user to draw on the screen. Sources of Java information can be readily obtained from WWW using a search engine. At the time of writing, [www.javasite.org](http://www.javasite.org) has interesting background and some basic examples of coding.

NOTE: Candidates will not be expected to write Java Applets but should have an appreciation of their purpose and be able to quote examples of what can be achieved within HTML using Java Applets.

## DATA TRANSFERS AND FORMATS

**URL** (Universal Resource Locator) – is address information enabling access to a server and then the path towards the appropriate source within that server. The syntax is of the format:

**Protocol://ISP/path**

Common protocol for internet users is HTTP. The ISP is likely to be the web address such as [www.icm.ac](http://www.icm.ac). The path might be a sub page showing the syllabus for the Network module.

**FTP (File Transfer Protocol)** is a protocol for downloading files from the web. The user may have to register.

**TCP (Transmission Control Protocol)** permits LANs and WANs to be interconnected. The ISO model (see above) dictates the structure of data package being sent.

**JPEG (Joint Picture Experts Group)** is a format for graphics storage. Each pixel, a mere small dot, requires 3 bytes of storage (one for each colour red, green and blue) and is known as 24-bit colour graphics. This would require enormous storage space if every bit of the bit-map had to be saved using 3-bytes. It would also take a long period of time to send this data over a communication link. JPEG formats use an algorithm to reduce the detail by compression methods so that minor changes across a small pattern can be ignored – the human eye is not capable of seeing the detail that the full picture would describe. With this compression, files can easily be cut to a tenth or small sizes.

**MPEG (Moving Picture Experts Group)** uses a similar compression technique for the transmission of moving pictures used by News Groups across the world. Many channels can be sent within the same bandwidth that would otherwise be used by one channel. MPEG enables TV to be seen on computer screens.

## SEARCH ENGINES

Many of the large ISPs provide a **search engine** which enables the user to search for information on the internet without having to know all the web site addresses. The user types in a single word or phrase and a search is made across all web sites for occurrences of the search conditions. If two or more words are in the condition, then the search list could have references to any one of the words which is why web sites use as many different words as possible to describe their information/products. By typing the phrase within quotes such as “Institute of Commercial Management”, the search will be limited to these (try it).

### CHARACTERISTICS OF THE SEARCH

**Hits** – The search will show how many sites match the condition and enable the user to improve the search conditions to reduce this. Typing “Institute of Commercial Management” produced over 30000 hits despite it all referring the one organisation – typing “ICM” would have accessed even more! The reason is that there are many aspects of the Institute’s web site but in addition, any other site with cross-references to the Institute will also show.

**Hit List** – Only a limited number can be shown in one “page” despite the scrolling and so there are links at the end to move to the next page.

**Priority Hits** – These are the sites that feature at the start that most users will access first. It therefore pays any organisation to find ways of moving to the first two pages – after that users often give up if they have not found what they want. There are two major ways of gaining priority.

- Clever choice of words and repeating them in the site descriptor
- Payment to the ISP can give them priority

**Site Descriptor** – Each site is described with a main title, a brief statement of its contents and finally the web address.

### *COOKIES*

These are small pieces of program coding stored on the user computer by ISPs to store information about you and enable them to customise the way the Internet accesses are portrayed. A recent search for a car could result in a cookie being saved on your computer which will mean that next time you log in, information about a car could appear. Cookies are also used to help you by storing passwords and account numbers so that these are automatically accessed at the next log in and bypassing the need for that information to be keyed in. There is a danger that a cookie could introduce a virus. Cookies are stored in a single area and can be deleted.

### AFFECTS OF INTERNET ON SOCIETY

- The number of people who are now buying goods on the Internet is increasing rapidly – most large retailers have set up online selling systems as an alternative to shop-fronts.
- Online selling systems has dramatically cut the paperwork in many situations and inevitably, also the manpower needed.
- It is becoming difficult with many organisations to make contact with them because telephone lines are automated and answered by computers and emails are one-way – the company can contact its clients but not the reverse.
- Search engines enable information of all kinds to found although the volume of it does often make it difficult to sort out the useful from the useless. The growth is likely to make this matter worse.
- Unsavoury material is too readily available for terrorism and pornography.
- The fact that the internet has no national boundaries means that it is very difficult to police. “Scams” are constantly being reported where people from foreign countries attempt to trick innocent Internet users with plausible methods that look authentic but whose sole purpose is to extort money by criminal methods. The public is fortunately becoming much wiser to this.
- While playing games in company time was once a time waster, accessing the Internet is probably more so now. The proliferation of emails wastes much time compounded by the fact that employees are using it for their own purposes.
- Details of the history of people’s use of the internet and email is being held in vast servers around the world and has been useful in combating some crime by providing time/date/place evidence.

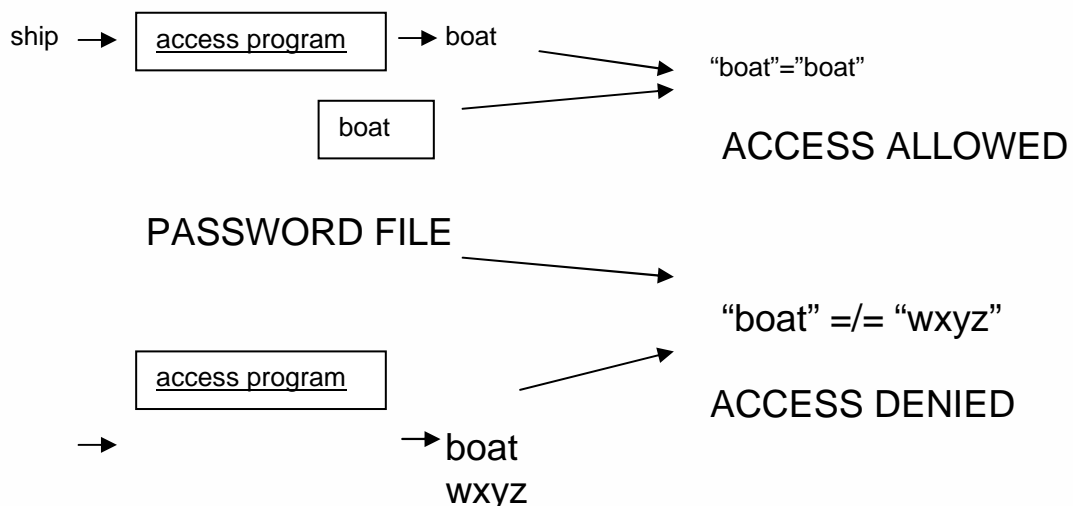
### INTERNET SECURITY

Security of data applies, as for any organisation but with the use of on-line systems, additional security is needed. (See Notes for Information Processing for general security measures.

- firewalls are needed to reduce unauthorised access
- data needs to be encrypted

## ENCRYPTION

- A simple form of encryption used over centuries was to replace each letter by another – A becomes B, B becomes C etc. This is far too simple and using computers, the code could be cracked in seconds. Decryption is simple by using the method in reverse.
- A more sophisticated method is to use a codebook. e.g. 123,5,7 might mean look in a particular book on page 123, line 5 word 7. Write this word down and then after it, all the other letters in the alphabet not used in that word. Underneath, write the alphabet in order and use a substitution method as above. This is not really any better than above other than the fact the code can be different for every message sent. Both these methods mean that the most common letters will be coded into the same letter and hence this will be recognisable. In English, “e” is the most common letter so if “k” is the most common letter in the code, it probably is an “e”. If not it is possibly “a”, “o”, “t” or “r”.
- An improvement is to use one of the above, code the first letter by substitution and then slide one line of the table a number of places before using substitution on the next letter. It therefore follows that a given letter will be encoded differently each time it is used. This is more difficult to crack but computers can do it given time.
- Encryption methods have progressed rapidly since the use of the above resulting in the terminology **strong and weak encryption**. Strong encryption is virtually impossible to break while Weak encryption could possibly be broken by large organisation, particularly government agencies.
- **Public key encryption** relies on a message being encrypted by using a known method but requiring a **private key** (which only the receiver has), to decrypt the message. An example of this uses prime numbers – a prime number has no factors except 1 and itself. 71879 and 99529 are prime numbers – not many people would know this. However, the product 71879 x 99529 is a large number. If A uses 71879 as a key in the encryption of data and sends the product P with the data, any interception will not help the decryption. However, if B knows the number 99529, he can determine 71879 by dividing his number into P and hence decrypt the method using a reverse process to the one used by A. In practice, very much larger prime numbers are used which would take even computers many years to determine.
- Accessing password files seems to be the common aim of hackers but in most cases, it is of no value. Suppose a password is “ship” and after encrypting, it would become “boat”. When the password was first devised, “ship” would be keyed in and coded into “boat” on the file. A hacker might locate the password file and read “boat” but if this is keyed in, perhaps to try to access a bank account, the program will encrypt “boat” in the usual way and turn it into some other code – e.g. “wxyz”. To access the account, the value in the password file must be the same as this encrypted value – “boat” is not “wxyz” and so access is denied.



## PASSWORDS

Candidates **MUST** make it clear in answering examination questions to what the password relates. A password could be keyed into a:

- **program** to access a particular account. e.g. bank account, email account
- **package** to determine the level of access that user has. A manager may be able to access all data, a supervisor less and an operative, only a basic restricted level of data.
- **device** to gain access to a room – this is very different from the other two.

Passwords can be checked by software and assessed how good they are on a scale 1 to 10. Many years ago, half the passwords used were “Rambo” because of a popular film.

- Now, systems require that a mixture of letter and number are used so that a name would not suffice. “Ac74\*nP6” is unlikely to be guessed.
- While upper case letters are ignored in web site names, they can be made to be critical in passwords.
- Systems can insist that a password is changed every two weeks and refuse access if the user does not make the change.
- Three incorrect attempts to input a password can cause the system to reject the access and require the user to contact the appropriate authority to be reinstated.

## **ROLE OF THE NETWORK MANAGER / SUPERVISOR**

- Install network and customise it
- Check the server contents and remove unwanted files
- Optimise storage by appropriate partitioning of the server
- Devise a privacy policy, publish it and monitor its use
- Devise a password system and issue passwords
- Manage access levels
- Check on password changes
- Putting new users onto the system
- Monitor the usage of passwords by an automatic log of accesses
- Virus control by constantly updating the virus checking facilities
- Dealing with day-to-day situations when users have access problems
- Keeping up to date with software manufacturer's updates
- Running training courses for new users and updates for existing users
- Ensuring copyright is not violated
- Ensuring privacy is maintained