



Rewarding Learning

ADVANCED
General Certificate of Education
2013

**Applied Information and
Communication Technology**

Assessment Unit A2 13

assessing

Unit 13: Networking and Communications

[A6J71]

TUESDAY 11 JUNE, AFTERNOON

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. With the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

1 Advantages of networking

- Share resources
 - Hardware and software
- Increase security
 - Issue log on codes and passwords
- Improve maintenance
 - Fix problems remotely
- Easier to upgrade software
 - No need to visit each station
- Any other acceptable advantage

Any 3 × [2] plus brief description

[6]

6

2 (a) Bus sketch

- Suitable bus based sketch, suitably labelled
- Should show single cable with a number of connected computers
- Mention of coaxial cable
- Mention of terminators

Any 2 × [1]

[2]

Star sketch

- Suitable star based diagram, suitably labelled
- Should show number of computers connected to hub or switch
- Should mention type of twisted pair cable

Any 2 × [1]

[2]

(b) Compare and contrast bus vs star

Level of response	Marking criteria	Mark band
Excellent	<p>Their discussion of the features of each system shows a very good knowledge of the requirements of connecting devices in each type of network. Their use of spelling, punctuation and grammar is excellent and clearly legible.</p> <p>They discuss the reasons for the changeover from bus based systems to star based systems in detail. Their discussion of the set-up for connection uses an excellent form and style.</p> <p>Their discussion is highly coherent and is very well organised and they use a wide range of correct specialist terms.</p>	[7]–[8]
Good	<p>Their discussion of the features of each system shows a good knowledge of the requirements of connecting devices in each type of network. Their use of spelling, punctuation and grammar is good and legible.</p> <p>They discuss the reasons for the changeover from bus based systems to star based systems. Their discussion of the set-up for connection uses a good form and style.</p> <p>Their discussion is coherent and is well organised and they use a range of correct specialist terms.</p>	[4]–[6]
Poor	<p>Their discussion of the features of each system shows a poor knowledge of the requirements of connecting devices in each type of network. Their use of spelling, punctuation and grammar is poor.</p> <p>They may omit discussion of the reasons for the changeover from bus based systems to star based systems. Their discussion of the set-up for connection uses a poor form and style.</p> <p>Their discussion is poor and is not organised and they use few correct specialist terms</p>	[1]–[3]

Descriptions of bus and star

Bus

- Mention of Ethernet topology for local area networks
- Systems communicating over Ethernet divide a stream of data into individual packets called frames.
 - Each frame contains source and destination addresses and error-checking
 - Bus based systems have issues with collisions
- The original 10BASE5 Ethernet (thicknet) used coaxial cable as a shared medium
- 10 base 2 was also used (thinnet)
- 10 = 10 Mbits/sec: Base = Baseband
- 2 = c.200 metres: 5 = 500 metres
- Repeaters needed to extend lengths of bus

Star

- Coaxial cables were replaced by twisted pair and fibre optic cables
- Hubs or switches were also used
- Data rates were increased from the original 10 megabits per second, to 100 gigabits per second
- Star networks use switches or hubs
- Hub or switch failing is a problem

Reasons for star popularity

- Star has replaced bus based and ring based systems because of its flexibility
- Star is easier to scale up
- Star is easier to manage
- Much improved data transmissions for star
- Star has now moved into very fast transmission via fibre optic
- Central hub or switch allows easier management
- Cabling is cheaper
- More reliable
- One node failing in star is not important whereas if the cable breaks in a bus the network won't work [8]

12

3 Computer networks operate on the same principle as the postal system when delivering messages. Each machine on a network has an **address** to which **data** can be forwarded. In order to reach its **destination** the package may have to cross multiple networks before it is delivered. On a computer there are two possible addressing mechanisms.

Physical addressing occurs **internally** within an organisation. It uses an address that is hard-coded on the Media Access Control unit – usually part of the network **card**. If this is replaced then the **MAC** address will change.

Another addressing mechanism is called Internet Protocol addressing (IP). This is used for **global** addressing.

Each correct answer = $8 \times [1]$ [8] 8

4 **Advantages of Bluetooth**

- Allows connection of mobile phones, computers, PDA, peripherals
- Uses short range wireless connection
- Low power radio frequency connection
- Easy to set up
- Developed protocol
- Inexpensive
- Doesn't require 'line of sight' as, say, infrared devices (e.g. TV controllers)

Any 3 features $\times [2]$ plus brief description [6] 6

5

A Trojan horse can send a copy of itself to everyone listed in an e-mail address book.	FALSE
SPAM consists of useful e-mail messages that a user has requested.	FALSE
Outgoing e-mail is handled by a server called the SMTP server.	TRUE
Instant messaging (IM) allows you to create a private electronic conversation with another individual.	TRUE
Incoming e-mail is handled by a server called the POP3 server.	TRUE
Streaming video is a sequence of moving images sent in compressed form over the Internet.	TRUE

Each correct response = $6 \times [1]$ [6] 6

6 Advantages of chat rooms

- The primary use of a chat room is to share information via text with a group of other users
 - Allows users in a particular chat room to be connected via a shared interest
 - Chat rooms exist catering for a wide range of subjects
 - New technology has enabled the use of file sharing and webcams to be included in some programs
 - Gaming is possible
- or any other suitable advantage

Disadvantages

- Children may be at risk
- Some chat rooms are not monitored and this could open issues with bad language and sexual content

Any 2 advantages + 2 disadvantages = $4 \times [2]$ plus brief description [8]

8

Level of response	Marking criteria	Mark band
Excellent	<p>The candidate provides excellent descriptions on both bridges and routers.</p> <p>Their use of spelling, punctuation and grammar is excellent and clearly legible.</p> <p>Their discussion of the features of each device shows a very good knowledge of the requirements of connecting devices in each type of network.</p> <p>Their discussion of the uses of each uses an excellent form and style.</p> <p>Their discussion of moving a device from one area to another demonstrates a very good knowledge of the features of each device.</p> <p>Their discussion is highly coherent and is very well organised and they use a wide range of correct specialist terms.</p>	[8]–[10]
Good	<p>The candidate provides good descriptions on both bridges and routers.</p> <p>Their use of spelling, punctuation and grammar is good and legible.</p> <p>Their discussion of the features of each device shows a good knowledge of the requirements of connecting devices in each type of network.</p> <p>Their discussion of the uses of each uses a good form and style.</p> <p>Their discussion of moving a device from one area to another demonstrates a good knowledge of the features of each device.</p> <p>Their discussion is coherent and is organised and they use a range of correct specialist terms.</p>	[4]–[7]
Poor	<p>The candidate provides some descriptions on bridges and routers.</p> <p>Their use of spelling, punctuation and grammar is poor.</p> <p>Their discussion of the features of each device shows little knowledge of the requirements of connecting devices in each type of network.</p> <p>Their discussion of the uses of each shows poor form and style.</p> <p>Their discussion of moving a device from one area to another demonstrates a poor knowledge of the features of each device.</p> <p>Their discussion is unorganised and they use few correct specialist terms.</p>	[1]–[3]

Bridges and routers – The following features may be found in the answers
 Bridging and routing are both ways of performing data control, but work through different methods.

Bridges

- Bridging takes place at OSI Model Layer 2 (data-link layer)
- A bridge directs frames according to hardware assigned MAC addresses
- Bridges are not concerned with and are unable to distinguish networks
- When designing a network, one can choose to put multiple segments into one bridged network
- If physically moved from one segment to another, a device doesn't have to be configured because the MAC address is permanent.

Routers

- Performs data control at OSI Model Layer 3 (network layer).
 - Makes its decisions according to assigned IP addresses.
 - Can distinguish between different networks
 - Different networks are interconnected by routers
 - If a host is physically moved from one network area to another in a routed network, it has to get a new IP address
- or any other valid feature

[10]

10

8 SSID

A wireless network's SSID is simply its name. Most wireless networks come with a default name (typically the name of the company which supplies the hardware, e.g. 'netgear'). It should be changed to a more meaningful name or disabled to prevent outsiders using the broadcast name.

WEP

They are types of security codes (encryption keys). If you set up your wireless router without a WEP key, anyone may be able to get onto the Internet via your wireless router. However if a WEP key is in place then only those in possession of the key can use the wireless router. It is somewhat insecure and has been replaced by WPA (Wi-fi Protected Access) standard.

MAC address

A MAC address is a permanent number that identifies the wireless adaptor inside your computer. It is a security device to uniquely identify a network device.

Any 3 × [2] plus brief description

[6]

6

9

1	DNS.....	E
2	An example of a URL	A
3	A proxy server.....	F
4	Maintaining a central list of IP addresses.....	B
5	IP.....	D
6	An important top level domain	C

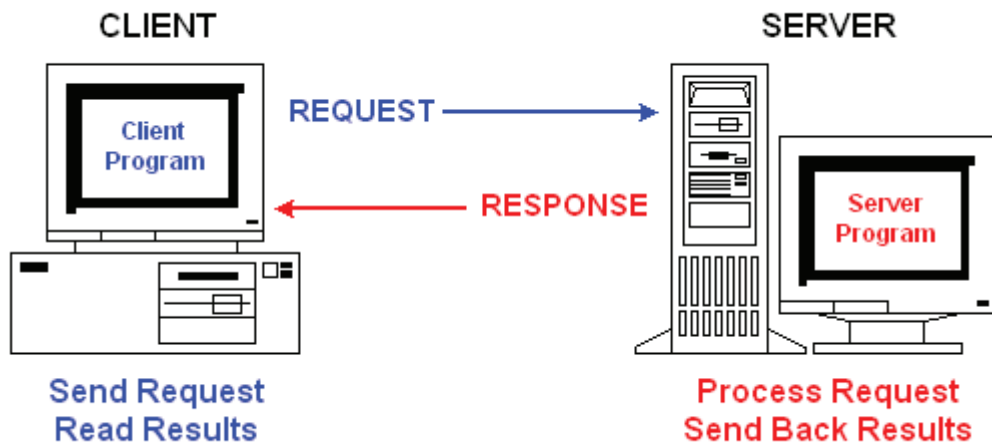
- A** is <http://www.typicalexample.org.uk>
- B** is impractical
- C** is .com
- D** is a packet based protocol for delivering data across networks
- E** is a TCP/IP system used to translate URL domain names into IP addresses
- F** sits between your computer and the web server whose pages you are accessing

Each correct answer = $6 \times [1]$

[6]

6

10 (a) Client Server Concepts



- A **client** is an individual user's computer or a user application that does a certain amount of processing on its own.
 - (i) It also sends and receives requests to and from one or more servers for other processing and/or data.
- A **server** consists of one or more computers that receive and process requests from one or more client machines.
 - (i) A server is typically designed with some redundancy in power, network, computing and file storage.

Sometimes the term "server" or "client" may refer to the software rather than the computer.

- (i) Thus, a "mail client" may refer to the mail software that resides on a client machine, rather than the machine itself.
- (ii) As client/server systems evolved, they contained built-in synchronization and sharing.

Client/servers have user accounts and sharing of resources and the system must separate and keep track of different users' files and applications during a user session and then free up those resources for another user session.

- VPN (Virtual Private Network) usually refers to the network in which some of the parts are connected using the public Internet, but the data sent across the Internet is encrypted, so the entire network is "virtually" private.

Any 3 statements \times [2] plus brief descriptions

[6]

(b) VPN

Level of response	Marking criteria	Mark band
Excellent	<p>The candidate provides excellent descriptions on VPN.</p> <p>Their use of spelling, punctuation and grammar is excellent and clearly legible.</p> <p>Their discussion of the features of VPN shows a very good knowledge of the requirements of connecting device.</p> <p>Their discussion of the uses of each uses an excellent form and style.</p> <p>Their discussion is highly coherent and is very well organised and they use a wide range of correct specialist terms.</p>	[5]–[6]
Good	<p>The candidate provides good descriptions on VPN.</p> <p>Their use of spelling, punctuation and grammar is good and legible.</p> <p>Their discussion of the features of VPN shows a good knowledge of the requirements of connecting device.</p> <p>Their discussion of the uses of each uses a good form and style.</p> <p>Their discussion is coherent and is well organised and they use a range of correct specialist terms.</p>	[3]–[4]
Poor	<p>The candidate provides few or little descriptions on VPN.</p> <p>Their use of spelling, punctuation and grammar is poor.</p> <p>Their discussion of the features of VPN shows a poor knowledge of the requirements of connecting device.</p> <p>Their discussion of the uses of each uses a poor form and style.</p> <p>Their discussion is unorganised and they use few correct specialist terms.</p>	[1]–[2]

- Using the Internet the office will use encrypted traffic
- It enables IP traffic to travel securely over a public TCP/IP network by encrypting all traffic from one network to another
- “Tunnelling” encrypts all information at the IP level
 - It is a way to communicate through the dedicated VPN server securely to the corporate network over the Internet
- When an employee on the move needs to securely connect to a corporate server but only has general access to the Internet, VPN is useful as security is guaranteed by means of the tunnel connection in which the entire information packet (content and header) is encrypted and encapsulated

[6]

12

11 Client Connection to the Internet

(a) PSTN (dialup)

- Public Switched Telephone Network refers to the international telephone system based on copper wires carrying **analogue** voice data
- It is an older technology which used a modem to transfer the computer's digital signal onto the analogue telephone cable
- Users had to dial up (as per a telephone call)
- Slow speeds of connection

(b) ISDN

- An international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires
- ISDN supports data transfer rates of 64 Kbps (64 000 bits per second).
- There are two types of ISDN:
 - Basic Rate Interface (BRI) – consists of two 64-Kbps B-channels and one D-channel for transmitting control information.
 - Primary Rate Interface (PRI) – consists of 23 B-channels and one D-channel (U.S.) or 30 B-channels and one D-channel (Europe)
- The original version of ISDN employed baseband transmission
- Another version, called B-ISDN, used broadband transmission and is able to support transmission rates of 1.5 Mbps. B-ISDN requires fibre optic cables

(c) Broadband

- This is a type of data transmission in which a single medium (wire) can carry several channels at once
 - Cable TV, for example, uses broadband transmission. In contrast, baseband transmission allows only one signal at a time
- Broadband is now the medium of choice for many (home) data transmissions
- Speeds are very good
- It is relatively inexpensive

Any 3 × [2] features

[6]

6

12 (a) Internet security issues

- Breaches of the network by external bodies
 - Network Address Translation allows devices, such as routers, to act as an agent between the Internet (a ‘public network’) and a local (‘private’) network and manages this because of the use of IP addresses. This means that for example, only a single, unique IP address is required to represent an entire group of computers
- Unauthorised Internet users accessing private networks
 - A firewall is a system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria
- Computer virus
 - Attaches itself to a program or file so it can spread from one computer to another, leaving infections as it travels
 - Protection by firewalls and anti-virus software
- Trojan horses and worms
 - Protection by firewalls and anti-virus software
- DoS attacks
 - It is an attack characterised by an explicit attempt to prevent legitimate users of a network service from using that service
 - The most common method is to flood a network with useless traffic, overloading the network’s capacity
 - Web content providers and router companies have placed new rules designed to prevent such an attack in their configuration tables

Any acceptable threat = 2 × [2]
 plus solution to the threat = 2 × [2] [8]

(b) Physical Network security

- Provide users with log-on accounts
- Use passwords
 - Encourage ‘strong’ passwords and that they be changed regularly
 - Don’t write down passwords
- Discourage users from installing their own programs
- Allocate appropriate rights and permissions
- Store servers in secure rooms – remove keyboards and/or screens
- Limit access to server rooms via passkeys
- Any other correct security reason

Any acceptable security reason = 2 × [3] [6]

	14	
Total		100