

Communication Systems 14.4 & 14.5

14.4 Communication and Information Systems

1. *In supporting the World Wide Web, describe the rôle of*

(a) *router*

(b) *a web server. (4 marks)*

(a)

- acts as a gateway / connects networks (1)
- maintains a table of available routes (1)
- reads the destination address (1)
- determines where / best route to forward packets/data (1) **Max (2x1) mark**

(b)

- serves files/ services http requests / to a web user/browser (1)
- builds/assembles / organises web pages (1)
- hosts web sites (1)
- filters content (1)
- restricts access (1) **Max (2x1) mark**

2. *Many organisations create their own intranet. Give four activities for which an organisation can make use of an intranet and, for each one, state why using the intranet is a benefit to the organisation. (8 marks)*

Activity (1) reason (1)

- stock control (1) low stock at one site can be rapidly remedied by transfer from another site (1)
- share data (1) all areas of business have access to same data at same time (1)
- share other resource (1) central print facility for many workstations (1)
- communicating/email/teleconferencing (1) exchange information without travel (1)
- user collaboration (1) document can be authored by multiple workers in different locations (1)
- hot desking/ teleworking (1) work in any geographical area of business /from home (1)

max 4 x (2, 1, 0)

14.4 Essay Question

3. *You are employed as an ICT consultant to an expanding tyre-fitting company. The company is planning to operate nationally, and is setting up new centres across the country. Your task is to advise on a computer network to connect the centres, and on the best method of storing and providing access to the company's data.*

Write a report for the owners of the company, paying particular attention to:

- *the advantages of computer networks,*
- *the nature and advantages of a distributed database,*
- *the nature and advantages of a client-server database.*

The quality of written communication will be assessed in your answer. (20 marks)

The solution for this question is intended to provide a framework of key concepts rather than a definitive solution. The aim is to establish an agreed standard that can be applied consistently, by all examiners, taking account of the many alternative answers to this type of question.

Allocation of marks:

- Advantages of computer networks (code as **N**) - **6** marks maximum
- Nature and advantages of a distributed database (code as **D**) - **6** marks maximum

- Nature and advantages of a client-server database (code as **C**) - 6 marks maximum.
- Maximum mark for content is 16/20** • Quality of written communication (code as **Q**) - 4 marks maximum.

Credit issue (1) plus further mark available for detailed expansion.

Advantages of computer networks (N marks):

- instant communication with all staff (1) e.g. e-mail (1)
- sharing software/files across company (1) e.g. using collaborative software (1)
- few printers between many workstations (1) through sharing printers (1)
- backup centrally coordinated (1) backup easier to control (1)
- travel time and cost saved (1) through video conferencing (1)
- everybody gets the information at the same time (1)) over an intranet (1)
- ability to do same work in any part of company (1) through hot desking (1)
- can access work off site/ save travelling (1) through teleworking (1)
- data sources external to the company can be accessed (1) via internet (1)
- can e.g. track printer usage (1) through network audit function (1)

Look for advantages of any corporate use of networks.

Advantages of distributed / client-server databases can be credited, but not twice. [max 6 marks]

4. (a) Organisations make use of the Internet for many activities. State **three** such legitimate activities. (3 marks)

(b) The World Wide Web is supported by a network infrastructure. This consists of a number of components.

(i) Describe the role of a router. (2 marks)

(ii) Describe the role of a web server. (2 marks)

(a)

any three:

- e-mail (1)
- selling products/services (1)
- ordering / purchasing (1)
- marketing/advertising products/services (1)
- training / support (1)
- recruitment (1)
- banking (1)
- information publication (1)
- VLE (1)
- information acquisition (1)
- video conferencing (1)
- voice over IP (1)
- remote backup (1) Max 3 x 1 (3 marks)

(b)

(i)

any two:

- acts as a gateway / connects networks (1)
- that maintains a table of available routes (1)
- that reads the destination address (1)
- that determines where to forward packets/data (1) Max 2 x 1 (2 marks)

(ii)

any two:

- serves files/ services http requests (1)
- to a web user/browser (1)

- that builds web pages (1)
- hosts web sites (1)
- content filtering (1)
- restricts access (1) Max 2 x 1 (2 marks)

5. Describe **three** ways in which a company can make use of computer networked systems.

Award one mark for a use (the WHAT), and one mark for the expansion (the WHY). The following are examples only.

- Distributed databases (1) so that all areas of the company have access to the same data at the same time (1)
- Centralised database (1) so that data can be added from across the company (1)
- Intranet (1) so that communication can be delivered to the desktop/ workstation/everybody gets the information at the same time (1)
- E-mail (1) so that communication can be delivered to all staff within the company (1)
- Tele/Video-conferencing (1) so that meetings can be arranged without the need for travel (1)
- Collaborative software (1); ability to work on the same document/ project/so that workers in different areas of the company can work together (1)
- Hot desking (1) ability to work in any part of the company/ still be able to access your own work areas (1)
- Internet access (1) so that data sources external to the company can be accessed (1)
- Share resources (1) e.g. a few printers between many workstations (1)
- Network audit function (1) e.g. tracking printer usage (1) **3 x (2,1,0) marks (6 marks)**

6. (a) College staff can obtain the A Level specifications for their subjects from the AQA website. These are provided as Portable Document Format (PDF) files. (a) Give **three** possible reasons why PDF has been selected as the format in which to provide these files.

(b) The AQA website has an Internet Protocol (IP) address, which has the form: n.nnn.nnn.nnn Explain the role of IP addresses in the functioning of the Internet.

(c) College staff do not need to know the IP address of the AQA website, as they can use the Uniform Resource Locator (URL) instead .<http://www.aqa.org.uk> .

Explain **two** benefits to the college staff of using the URL.

(3 marks)(2 marks)(4 marks)

(a) The following answers are examples only. Allow one mark for any point that relates to why the exam board have chosen PDF. Any 3:

- standard for document sharing on the web (1)
- exam board cannot guarantee the system type that viewers will have (1)
- software to read the document is freely available (1)
- formatting is retained. (1)
- .e.g. logos/ forms/ fonts (1)
- content can be copied and pasted into other applications (1)
- content of this document format is easily accessible but harder to change (1) **Max 3 x 1(3)**

(b) Any 2:

- uniquely identifies single machine (1)
- if more than one machine has same address, data cannot be routed towards it (1)
- provides a consistent way to refer to a specific machine (1)
- formal standard for addressing (1)
- hierarchical addressing scheme (1)

DO NOT accept answers about URLs . this part of question specifically asks about IP addressing. Max 2 x 1 2 marks

(c) Example answers. Credit any reasonable response.

• **benefit (1) expansion (1)**

- staff find it more readable/ understandable than IP address (1) well-chosen name easier to recognize than numbers (1)
- staff more likely to remember (1) don't have to remember IP addresses (1)
- staff able to view selected information (1) points to a specific web page /website (1)
- staff don't have to be aware of changing IP addresses (1) can be redirected (1)

DO NOT accept answers explaining IP addresses . this part of question specifically asks about URLs. 2 x (2, 1, 0) 4 marks

7. (This question is similar – but the emphasis is also on 14.5.)

A teacher wishes to read the GCE Advanced Mathematics syllabus on the AQA website. The website holds this syllabus in a format known as Portable Document Format (PDF).

*(a) Give **three** reasons why PDF has been selected as the format in which to offer this file.*

(b) When the teacher tries to print the PDF file, it is discovered that the correct printer driver is not installed. Explain why a printer driver is necessary.

(c) In order to acquire the correct printer driver, the printer manufacturer's website is visited. When the link leading to the download area of the website is followed, the address becomes "http://192.168.0.233/downloads/drivers.htm".

(i) What does the "http" part of the address represent?

(ii) "192.168.0.233" is an Internet address.

Explain why Internet addresses are important for the correct functioning of the Internet.

a) The following answers are examples only. Allow one mark for any point that relates to why the exam board have chosen PDF.

- de facto standard for document sharing on the web (1)
- exam board cannot guarantee the system type that viewers will have (1)
- software to read the document is freely available (1)
- formatting is retained (1)
- e.g. logos/ forms/ fonts (1)
- content can be copied and pasted into other applications (1)
- content of this document format is easily accessible but harder to change (1) **3 x 1 mark (3)**

b) Any 2 from:

- translates document into a form usable by the printer (1) e.g. deals with margins/ fonts/ paper sizes/ etc. (1)
- enables communication between printer and OS/ application package (1) **2 x 1 mark**

c)

i) the protocol being used (1) **1 mark**

ii)

- needs to be unique so that only one machine is identified (1)
- if more than one machine has the same address, data cannot be routed towards it (1)
- provides a consistent way to refer to a specific machine (1)
- formal standard for addressing (1)
- hierarchical addressing scheme (1)
- DO NOT accept answers about URLs – question specifically asks about IP addressing.

3 x 1 mark (3 marks)

8. Computer networks are an integral part of life in the 21st century. The infrastructure must be efficient if these networks are to be of use. (2 marks)

(a) Define the term *client*, as it applies to computer networks. (2 marks)

(b) Define the term *server*, as it applies to computer networks. (4 marks)

(c) Describe **two** advantages of a client/server database over a nonclient/server database.

(d) Explain the rôle of routers in computer networks. (2 marks)

(a) One mark for each point made, up to 2 marks. E.g.;

- local workstation/computer/software (1)
- makes requests for applications/data to a server (1)
- may not have a lot of local processing power (1) **2 x 1 mark**

(b) One mark for each point made, up to 2 marks. E.g.;

- remote/powerful computer (1)
- provides resources/data to clients(1)
- point at which processing is carried out (1) **2 x 1 mark**

(c) First mark for stating advantage, and second mark for saying why better than a non-client/server database. Ensure that marks are awarded for points related to client/server database not client/server network

- expensive resource is made available to a large user base (1) ; this is more cost effective (1)
- consistency of the data is maintained (1); only one copy of the data is held on the server, rather than copies held on workstations (1)
- processing is done at the server (1); the client does not need to be so powerful (1)
- communication between client and server is minimal (1); only requests and results are communicated, rather than entire databases (1)
- Department specific report formats or queries can be held on workstations (1) meaning that less room is taken up on the server/these are less likely to be accessed by the .wrong. people (1) **2 x (2,1,0) marks**

(d) one mark per point, up to a maximum of two points. The following are examples.

- Let traffic flow between networks/ allow access to other networks/use as a gateway (1)
- Best path determination/ decides next portion of journey (1)
- Switching function/ takes packet from one network/interface and moves it to another (1)
- Allow build up a knowledge of the network(s) (1)
- Allow packet filtering/use as a firewall (1) **2 x 1 mark**

14.5 Networks

1. All the activity on an organisation's computer network can be logged. One reason for this logging is to charge departments for their use of system resources.

(a) Give **four** other reasons for logging network activity and, for each one, state the data that needs to be recorded. (8 marks)

(b) Explain **one** possible drawback of logging network activity. (2 marks)

TO CHARGE FOR USE (0) **Use (1) Data item (1)** EXAMPLE ANSWERS.

Eg 1:

provide systems administration with information about network load /performance (1) bandwidth used per user / per connection / storage capacities/ peak throughput times(1)

Eg 2:

monitoring software licenses (1) number of concurrent users / time spent running any particular software (1)

Eg 3:

to configure disk storage allocations /locations (1) storage used per account (1)

Eg 4:

to facilitate sensible distribution / limitation of resources to users / discourage waste of resources (1) pages printed per print job / user (1)

Eg 5:

help in controlling abuse of network (1) monitoring failed logins / web sites visited (1)

4 x (2, 1, 0) marks

b)

Accept any reasonable answers eg.

logging activities entails use of processor time (1) that slows system down (1)

logging activities may involve large volume of data (1) leaving reduced space for network activity (1)

considerable human resources required (1) to analyse and interpret the data logged (1)

1x(2,1,0) marks

2. Many network systems maintain a log that is used to monitor use of the network's resources.

*(a) State **three** items of data that you would expect to be held in such a log.*

*(b) Describe **one** possible task for which this log can be used.*

a) The following answers are examples only. Allow one mark per sensible suggestion for a log entry, up to a maximum of 3.

- a record of facilities used by each person including processor time(1),
- number of pages printed (1)
- amount of disk space used (1).
- details of systems failures/ crashes/error messages (1)
- details of files stored/ updated/deleted (1)
- details of e-mail usage/storage (1)
- IDs of logged-on users (1)
- network address/hardware id of logged on users/details of workstations (1)
- time & duration of log in/log out/ when logged in (1)
- details of applications used/count of users per application/ number of licenses used (1)
- details of network traffic (1)
- number of failed log on attempts for a user (1)
- number of attempts to access blocked websites (1) 3 x 1 mark

b) The following answers are examples only. Allow one mark for what the task is, and one mark for how the log can be used for this task.

- observe usage patterns of users (1) so that peak times can be anticipated and planned for (1)
- observe where there are issues of congestion (1) so that strategies for upgrading/replacement can be formulated (1)
- monitor usage of scarce resources e.g. colour laser printers (1) so that users can be charged correctly (1) 1 x (2,1,0) marks (3 marks)

3. Whilst planning to install a network accounting system, a company has become concerned about the security of its local computer network.

(a) Explain **two** procedures that the company could adopt to discourage breaches of security. 6 marks

(b) State **two** reasons for using accounting software on a network. **2 marks**

a)

- Procedures for employing/ vetting staff (3,2,1,0)
- Procedures for restricting/ controlling system access (3,2,1,0)
- Procedures for use of information gained from network accounting/ auditing systems (3,2,1,0)
- Procedures for the use of removable media (3,2,1,0)

Credit any point that relates to company issues and that can justifiably form part of a code of practice. Marks can allocated for: what is the procedure (1), expansion (1) why is it an appropriate procedure for the company (1) NB The question is about procedures. 2 × (3,2,1,0)

b)

- Charge users for use of scarce/expensive resources e.g. colour printing (1)
- See where network has high traffic in terms of time or location so that it can be dealt with/charges adjusted accordingly (1)
- To ensure that resources are being utilised efficiently (1)
- Encourage efficient use of resources (1)
- Able to vary charges with respect to requirement and/ or utilisation (1) 2 × 1 mark

Total 8 marks

4. A Personal Assistant to a senior manager leaves a job where he used a standalone desktop computer, and begins a new job where the computer he uses is on a network. There are differences between the old interface and the new one.

(a) Describe **one** difference that he may notice between the old and new user interfaces for:

(i) the security of the system; (2 marks)

(ii) control of the software used; (2 marks)

(iii) control of the files that can be accessed; (2 marks)

(iv) access rights to resources. (2 marks)

(b) All activities on the network are logged automatically. (2 marks)

Give two reasons why this is done.

All sections, Allow answers that relate to other sections providing they are not duplicate of previous responses.

a) i)

- need to login to the system (1) puts more dialogue in place before accessing the system proper (1)
- password management (1) e.g. minimum password length message (1)

(2,1,0) marks

ii)

- access to software restricted (1) as only the licensed number of concurrent copies can run at any one time(1)
- users are only allowed to use certain software at certain times (1) e.g. normally not outside workers contracted hours (1)

(2,1,0) marks

iii)

- file may be passworded (1) require authorisation to view (1)

- status message relating to the file appears (1) users are aware of others
- accessing the files (1)

(2,1,0) marks

iv)

- users can 'see' certain printers (1) users in different areas see different printers/different user logging on to the same machine see different printers. (1)
- users can only see network drives relevant to their needs (1) administrators see most/all resources whilst users see a restricted set (1)

(2,1,0) marks

b)

Any two:

- To detect/deter misuse
- To monitor network traffic
- To monitor software use
- To monitor hardware use
- To monitor other resource use
- NOT to log/track any activity (repeats question)

Max 2 marks

5. (a) *Security problems can arise when using computer networks. Name **two** methods of protecting the security of a computer network, and describe how each one protects the network. (4 marks)*

(b) *Network accounting software records network usage data. Give **three** items of network usage data which may be recorded and, for each one, describe how the network administrator may make use of it. (6 marks)*

(a)

Answers must relate to the security of a network - not just a computer room. method (1) description (1)

- Use encryption / https (1) so that anyone getting hold of the data is not able to make sense of it (1)
- Use passwords/ logins (1) to deter unauthorised access to the system (1)
- Set access levels (1) to control access to selected parts of the system (1)
- Use up to date anti-virus / protection software (1) to protect network from corruption / intrusion (1)
- Use procedures for the use of removable media (1) avoid viruses (1)
- Use a firewall (1) e.g. to provide a filter on traffic coming in/ going out (1) **max 2 x (2, 1, 0)**

(b)

data item (1) expansion/description of use (1) e.g.

- resources e.g. printer / consumables (1) to encourage economical use (1)
- application software / communications software / email / internet use (1) e.g. to inform licensing decisions (1)
- network traffic (1) to encourage off peak usage (1)
- processor use (1) to assist predicting future hardware requirements (1)
- hard disk space (1) to re-allocate according to departmental needs (1)

allow .to bill appropriately. as expansion ONCE only

max 3 x (2, 1, 0)

6. A company has a computer network system. Activity on this network is monitored by software and an accounting log is automatically produced so that departments can be charged for their use of system resources.

(a) State **four** items of data that this log might include. 4 marks

(b) Give **four** reasons why such a log is useful. 4 marks

(a) maximum 4 from:

- a record of facilities used by each person including processor time(1),
- no of pages printed (1)
- disk space used (1).
- details of systems failures/ crashes/error messages (1)
- details files stored/ updated/deleted (1)
- details of e-mail usage/storage (1)
- IDs of logged-on users/who (1)
- network address/hardware id of logged on users/details of workstations (1)
- time & duration of log in/log out/ when logged in (1)
- details of applications used/count of users per application/ no. of licenses used (1)
- details of network traffic (1)
- details of failed login attempts (1)

4 x 1 mark

(b) maximum 4 from:

- provide systems administration with information about network load (1)
- monitoring software licenses (1)
- enable administrators to deal with network performance problems (1)
- facilitate sensible distribution of resources to users (1) e.g. memory/time/ printers/ etc.
- to limit use of scarce resources (1),
- inform decisions about any upgrade or systems enhancement (1)
- help in tracking abuse of network (1)
- enable administrator to identify and support novice users (1)

4 x 1 mark

7. Essay Question 14.4 & 14.5

You are in charge of ICT in a large secondary school that has to be rebuilt. The head teacher wants all the computers in the new buildings to be networked. Write a report for the head teacher on the issues involved. Pay particular attention to:

- *security measures for the network;*
- *network auditing;*
- *network accounting.*

The Quality Of Written Communication will be assessed in your answer. (20 marks)

The solution for this question is intended to provide a framework of key concepts rather than a definitive solution. The aim is to establish an agreed standard that can be applied consistently, by all examiners, taking account of the many alternative answers to this type of question.

The question asks for a report. Do not penalize the candidate if the answer is not presented as a report.

Allocation of marks:

Security measures for the network (code as **S**) - 6 marks maximum

Network auditing (code as **U**) - 6 marks maximum

Network accounting (code as **C**) - 6 marks maximum

Maximum mark for content is 16/20

Quality of Written Communication (code as **Q**) - 4 marks maximum

Security measures for the network (S marks)

Marks are for what the measure is or for threat/how this is effective/other expansion. Don't give same expansion twice.

- Use firewall (1) protect system from attack/hackers (1)
- Set access rights/levels (1) so only authorised users have access to sensitive data/need login and password (1)
- Install anti-virus software (1) protect from viruses (1)
- Use audit trails (1) detect misuse (1) **(not here and in U)**
- Use physical measures/locks/security officers (1) prevent physical access/theft (1)
- Backup server / fit UPS(1) protect from natural disaster/power failure (1)
- Code of conduct / company rules (1) example of security procedure (1)
- Credit any sensible **network** answer (1) **[max 6 x 1 marks]**