



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

INFORMATION TECHNOLOGY P2

EXEMPLAR 2008

MARKS: 180

TIME: 3 hours

This question paper consists of 16 pages.

INSTRUCTIONS AND INFORMATION

1. This paper consists of SIX questions.
2. Answer ALL the questions.
3. Read ALL the questions carefully.

SECTION A: MULTIPLE-CHOICE QUESTIONS**QUESTION 1**

Various possible options are provided as answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number (1.1 – 1.10) in the ANSWER BOOK, for example: 1.11 D.

- 1.1 One of the factors that has led to the development of faster computer systems in recent years is the ...
- A reduction of the number and complexity of instructions used by the CPU.
 - B trend towards no longer using stiffy disks.
 - C use of virtual memory.
 - D use of CISC.
- 1.2 ... is a protocol that provides some protection for users of sites such as those that supply internet banking.
- A FTP
 - B HTML
 - C HTTPS
 - D HTTP
- 1.3 A simulation ...
- A is used when unusual input data is used to test new software.
 - B is the situation where virtual memory is used to alleviate a lack of available RAM.
 - C uses AI software to allow the computer to play a chess game against a human opponent.
 - D is a computer program which emulates a real-life situation such as a prediction of weather patterns.
- 1.4 Intellectual property rights ...
- A indicate the permission granted to an individual to refer to a document created by another author.
 - B refer to the situation where the author of a software application claims ownership of the idea behind his program.
 - C refer to the rights a web site has over its pictures on the site.
 - D refer to the published document outlining the rights of an individual who published a book on the internet.
- 1.5 An example of a smart phone is ...
- A a handset which can receive e-mails.
 - B when Skype is used on a network PC.
 - C a cell phone which has internet connectivity and provides a GUI.
 - D one which keeps track of all incoming and outgoing calls.

1.6 A search engine ...

- A is automatically loaded when you activate an internet browser.
- B can be used to send and receive e-mails.
- C is software which enables the user to find web sites pertaining to a research topic.
- D is browser software which locates all existing URLs which fit a given description on the internet.

1.7 A heat sink is ...

- A a device used to conduct heat away from components such as the CPU.
- B a program which monitors the internal temperature of the computer.
- C a device which is used to regulate the heat produced by the power supply unit.
- D software which is used to measure the power consumption of the computer.

1.8 A north bridge is ...

- A a set of capacitors which reduce current drawn by the mother board.
- B the chipset on the mother board connecting to faster mother board components.
- C a form of dynamic RAM.
- D a link between the CPU and the keyboard.

1.9 The Symbian OS is characterised by ...

- A being an open-source multitasking OS designed for smart phones.
- B the use of multi-threading.
- C a sophisticated but memory-hungry GUI.
- D the use of a graphics co-processor.

1.10 A firewire port is ...

- A slower than a USB1 port.
- B normally used to connect a printer to a PC.
- C used to connect the BIOS to the CPU.
- D best suited to video communications.

TOTAL SECTION A (10 x 1): 10

The scenario below must be used to answer the questions in SECTIONS B, C, D and E.

SCENARIO

Several schools situated in a rural area have decided to upgrade their IT facilities. They have received funding to do so. They want to improve their PCs, local area networks, their communication with each other and their connection to the internet.

At present each school is running a peer-to-peer network. The computers are being used for administrative work, educational programmes, computer-aided learning, as well as the teaching of Computer Applications Technology and Information Technology. A typical configuration of one of the PCs at the schools is:

- 66 MHz Pentium 2
- 32 MB RAM
- 100 MB hard drive
- 1.44 MB floppy drive
- USB 1 port
- Standard keyboard, mouse and colour monitor

SECTION B: HARDWARE AND SOFTWARE

QUESTION 2: HARDWARE AND SOFTWARE

Representatives of all the schools and their sponsors met and decided to employ several consultants to advise them on various aspects of the upgrade. Place yourself in the position of one of these consultants when answering the following questions.

2.1 Step one is the upgrading of the computers at each school and the upgrade of each local area network. There are between 20 and 28 computers in each school's computer laboratory. Each of the schools will standardise on the same computer configuration and the same type of local area network (LAN).

- 2.1.1 Suggest a suitable processor speed for the computers. Justify your answer. (2)
- 2.1.2 Suggest a suitable amount of memory for each computer. Justify your answer. (2)
- 2.1.3 Suggest a suitable hard drive size. Justify your answer. (2)
- 2.1.4 Following your advice they decide to purchase 17" flat screen LCD monitors. Give TWO reasons why these screens are more advantageous than the older CRT monitors. (2)

- 2.1.5 After some discussion it was decided not to include stiffy disk drives in the computer configuration.
- (a) What would stiffy disks have been used for by network users? (1)
- (b) Give TWO reasons for not including stiffy drives in the new computers. (2)
- (c) Suggest a suitable replacement for the stiffy disks and state ONE advantage of the new alternative. (2)
- 2.2 You recommend that the network setup should be changed from a peer-to-peer network to a client-server network.
- 2.2.1 (a) What is the overall function of a server? (1)
- (b) Name TWO features of the computer which will act as a server, which would be different from the computers which will act as clients. (2)
- (c) The network can consist of fat clients or thin clients. Explain the difference between these two types of clients. (2)
- 2.2.2 In a peer-to-peer network printers can be shared amongst network users.
- (a) Explain how this is implemented in a peer-to-peer network. (2)
- (b) How do network users get access to printers on a client-server network? (2)
- 2.3 A network administrator will have to be appointed to maintain the network.
- 2.3.1 One of the major concerns of network users is security on the network. Learners should not be able to get unauthorised access to computers on the network. Discuss the duties of the network administrator regarding security. (2)
- 2.3.2 List THREE other duties of a network administrator. (3)
- 2.4 Every computer, including the server, has to have a suitable operating system. The network in each school will standardise on the same operating system.
- 2.4.1 What network operating system would you recommend and why? (2)
- 2.4.2 Name THREE specific functions that a network operating system must perform. (3)

- 2.5 These days it is common to purchase a server that offers multi-processing.
- 2.5.1 Give TWO examples of multi-processing in a server configuration. (2)
- 2.5.2 Explain *hyperthreading*. (3)
- 2.5.3 Pipelining is another technique that is used by modern processors. Briefly explain why pipelining improves performance. (2)
- 2.5.4 When there is insufficient RAM for an application, secondary storage is utilised to implement virtual memory.
- (a) How does this affect the performance of the system? (1)
(b) Give a reason for your answer in QUESTION 2.5.4 (a). (2)
- 2.5.5 In earlier computers 'cache store' was the term used for high-speed memory situated between the CPU and RAM. The modern equivalent of cache store is called cache memory.
- (a) Where is cache memory found in modern systems? (2)
(b) Why does cache memory improve the performance of computer systems? (2)
- 2.6 Some of the schools have some old network cards that were connected to co-axial cables. An upgrade would be to use UTP cables.
- 2.6.1 List THREE general problems that can be associated with cables as a communication medium in general. (3)
- 2.6.2 State TWO advantages of UTP cables. (2)
- 2.6.3 If the school should try to use the old network cards the device drivers would be out of date. They will not function in the current system.
- (a) What is a *device driver* in this context? (2)
(b) What would your advice be to solve this problem for the current system? Justify your answer. (2)

TOTAL SECTION B: 55

SECTION C: APPLICATIONS AND IMPLICATIONS**QUESTION 3: e-COMMUNICATION**

- 3.1 The possibility of making use of wireless communication has been discussed.
- 3.1.1 One of the latest developments in wireless communication is WiMax.
- (a) What is *WiMax*? (1)
- (b) Why will WiMax be a suitable way to provide e-communication to people in South Africa? (2)
- 3.1.2 One of the disadvantages of a wireless internet service is that it can be used without permission if the network is not secure. Briefly explain how this can happen. (2)
- 3.2 With the upgraded computer system learners will be able to retrieve information from the internet to do their school projects. When information is obtained from the internet it should be acknowledged, but there is still a possibility that the information can be incorrect. State TWO ways to verify that the information retrieved is correct. (2)
- 3.3 The internet can also be used to transfer information. Briefly explain how a digital signature can verify the identity of the sender of a message or information. (4)
- 3.4 How will an internet user be able to identify a secure website? (2)
- [13]**

QUESTION 4: SOCIAL AND ETHICAL ISSUES

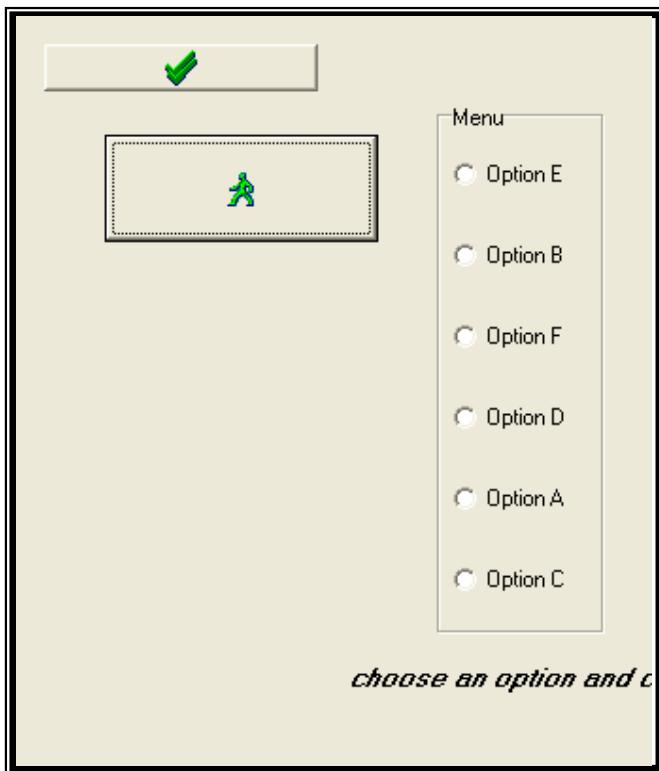
- 4.1 Learners must be aware of computer ethics when they use the internet to do research for their projects.
- 4.1.1 What is *computer ethics*? (2)
- 4.1.2 Discuss TWO examples of unethical internet behaviour in this scenario. (2)
- 4.2 Explain how spyware violates the privacy of the internet user. (2)
- 4.3 Information and communication technology will be a reality in the computer centre once the upgrade has been done. Discuss the positive effects that these technologies can have on education in South Africa. (2)
- [8]**

TOTAL SECTION C: **21**

SECTION D: PROGRAMMING AND SOFTWARE DEVELOPMENT**QUESTION 5: ALGORITHMS AND PLANNING**

The school has to manage the network once it has been installed. A small task team consisting of the IT educator, who will be the coordinator, and a few motivated Grade 12 learners serve on this team. Assume that you are the leader of the team.

- 5.1 In order to automate the process it is suggested that a short program should be written to allow any user access to the various utilities. One inexperienced member of the team comes up with the following sample GUI.

**FIGURE 5.1**

When designing a GUI a number of factors are taken into account. Using the factors listed below, analyse the given example of a GUI (FIGURE 5.1) and in each case give TWO examples of bad design that you can identify.

- | | | |
|-------|--------------------------|-----|
| 5.1.1 | The layout of the screen | (2) |
| 5.1.2 | User-friendliness | (2) |
| 5.1.3 | Navigation | (2) |

- 5.2 The team has to keep track of users' sessions on the internet. You suggest a database approach to solve this problem.

5.2.1 Motivate your suggestion by listing THREE advantages of a database approach. (3)

5.2.2 The team compiled the database. Analyse the entries in the database table below and answer the questions that follow.

Name	Text	Name and surname
Group	Text	Grade and class e.g. 11A or 12B
Date of session	Date/Time	Date of access to Internet
Starting time	Date/Time	Time of access to Internet
End time	Date/Time	Time of end of session on Internet
MB downloaded	Number	In terms of Megabytes. Limit is 20 Megabyte
Amount	Currency	Amount owed for this session
Total amount owed	Currency	Total amount
AccountNumber	Text	Combination of a number and the group e.g. 11A001

FIGURE 5.2

Name	Group	Date of session	Starting time	End time	MB downloaded	Amount	Total amount owed	AccountNumber
Sam Sithole	11A	2007/10/15	10:15	11:15	0	R 2.50	R 2.50	11A001
Peter Johnson	10B	2007/10/15	10:15	12:00	2	R 10.60	R 20.60	10B001
Peter Johnson	12C	2007/10/15	09:30	10:30	10	R 35.50	R 35.50	12C001
Betha Mathews	10C	2007/10/17	10:15	11:15	2	R 10.60	R 30.60	10C002
Ryan Ferreira	12B	2007/10/17	09:30	10:30	10	R 35.50	R 35.50	12B002
Sam Sithole	11A	2007/10/17	10:15	11:15	30	R 105.50	R 15.00	11A001
Peter Johnson	12C	2007/10/18	12:15	13:15	3	R 12.50	R 48.00	12C001
Gregory Mokoena	12B	2007/10/18	09:30	10:30	3	R 12.50	R 12.50	12B003
Pamela Xaba	10B	2007/10/18	10:15	10:15	2	R 10.60	R 10.60	10B002
Shane Moodley	12B	2007/10/19	09:30	10:30	3	R 8.50	R 8.50	12B001
Ryan Ferreira	12B	2008/10/19	09:30	10:30	10	R 35.50	R 141.00	12B002
Shane Moodley	12B	2007/10/20	09:30	10:30	10	R 35.50	R 44.00	12B001

FIGURE 5.3

(a) An invalid entry was made in the given database table (FIGURE 5.3) in the field called **MB downloaded**. Use this example to explain the possible negative effects that invalid data entries can have on the company running an application using the invalid data. (2)

(b) Indicate how the invalid entry of data in this case (FIGURE 5.3) could have been prevented. Use validation and error messages. (2)

(c) After you have analysed the data entries you try to convince the team to normalise the database. State TWO advantages of normalisation as part of your argument. You may refer to the entries in the given database to prove your point. (2)

- (d) Show how you would normalise the data in the given database from 0NF to 1NF (first normalised form) by redesigning the given database. Take the single table (FIGURE 5.2) and split it into two tables. All the original fields given in the original table must appear in your new design. You are allowed to add extra fields to accommodate the normalisation process.

Show the following as part of your design:

- The fields that make up the new tables
- Primary keys (PK)
- Foreign key(s) (FK)

(6)

- 5.3 A unique network user name needs to be generated for each new user. A text file called **UNames.txt** has been created to store the user names.

User names are created as follows:

Take the first two characters of the first name and add it to the last name of the user (for example John Brown – BrownJo). If a similar user name is found in the text file **UNames.txt**, repeat the process, but the next two characters of the first name must be taken and added to the last name (for example John Brown – Brownoh) and so on, until the user name created in this way is not found in the text file.

Develop an algorithm that can be used to develop a software solution to generate the user names in the way described above, and add it to the text file.

(10)

- 5.4 One of the team members suggests that the text file containing the user names should be encrypted.

Do you support this suggestion? Substantiate your answer by defining *encryption* and indicating the purpose thereof.

(3)

- 5.5 Each user should also have a unique password. One of the team members has created the following algorithm to create passwords.

1. Total \leftarrow 0
2. Type in the ID number of the user
3. Year \leftarrow first two digits of ID number
4. Age \leftarrow current year – (1900 + Year)
5. Value \leftarrow Age * 1234567891
6. Password \leftarrow remainder of value divided by 10 000

The algorithm is used to write a program in the programming language you are using. When the program is executed you find that the value calculated in step 5 gives an incorrect negative value.

- 5.5.1 The program did not show any error during compilation, but the answer is wrong. What is this type of error called? (1)
- 5.5.2 Explain the reason why the error occurred. (2)
- 5.6 The team has to write an object-oriented program to keep record of all the users of a LAN.

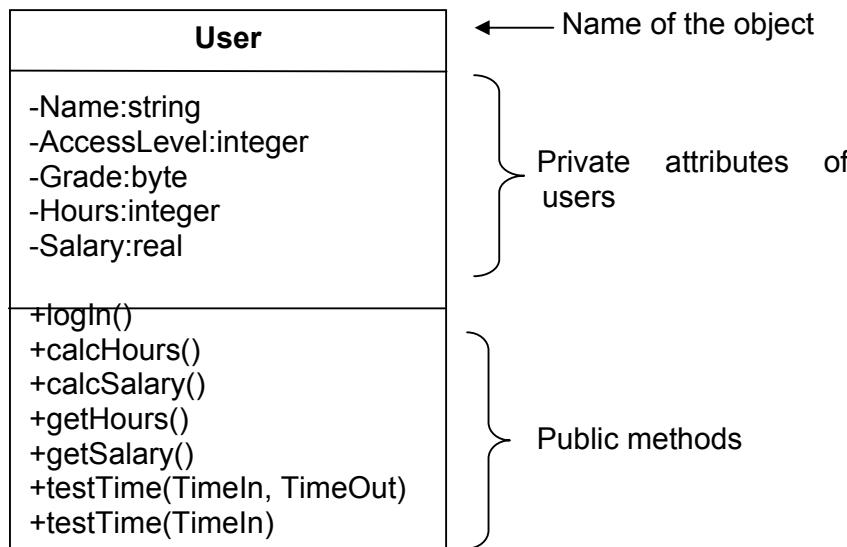
There are two types of users in a network: learners and administrators.

Learners have level 1 access to the network and will only be allowed to access the network between 08:00 and 15:00.

The **administrator(s)** will have level 2 access and will be able to access the network 24 hours a day. The time the administrator spends on the network per week must be recorded and calculated in terms of hours. The administrator will be paid accordingly.

The program must be able to deny access to users who try to login outside of their specified time limits.

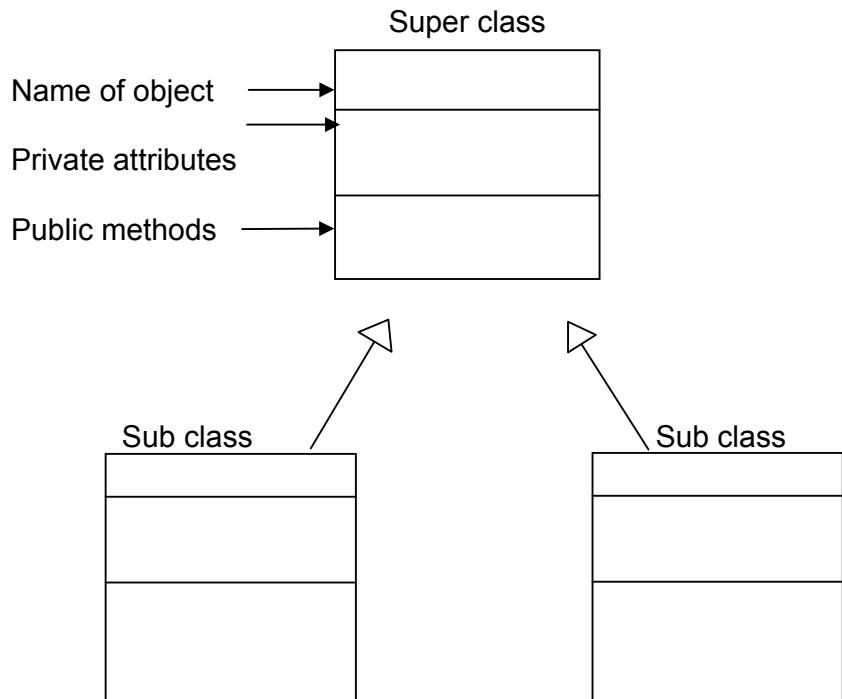
The following diagram was compiled to represent a user object:



- 5.6.1 Define each of the following concepts and use the given scenario and the information in the given class diagram to give an example in each case:
- (a) Polymorphism (2)
 (b) Encapsulation (2)

5.6.2 The team decides to use the object User as a super class and to compile two subclasses that will be able to inherit attributes and methods from the super class.

- (a) Briefly explain the advantage of inheritance. Refer to the super class and subclasses you have identified as part of your explanation. (2)
- (b) Copy the following incomplete diagram given below. Study the given scenario. Complete the diagram you have copied by indicating the following:
- (i) The names of the super class and the two subclasses in the diagram
 - (ii) The attributes and methods that the subclasses will inherit from the super class and those that will NOT be inherited

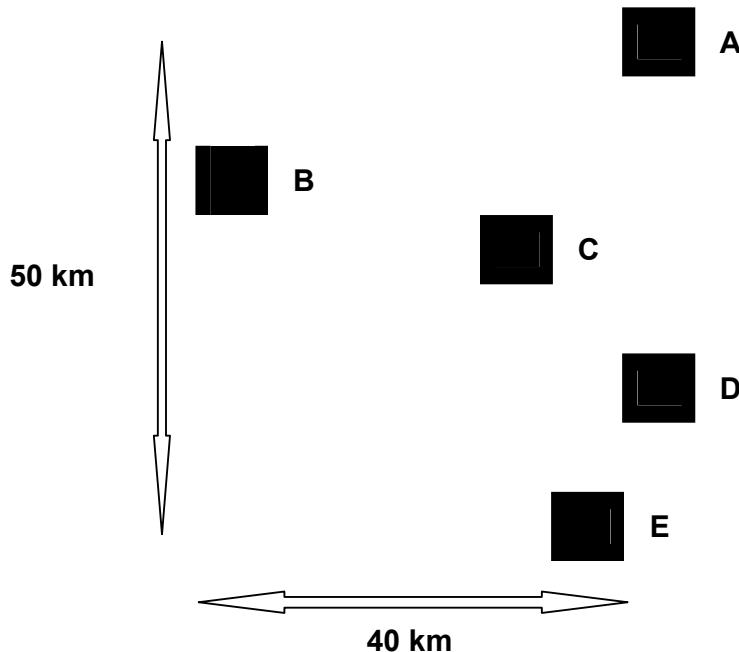


(6)

TOTAL SECTION D: 49

SECTION E: INTEGRATED SCENARIO**QUESTION 6**

- 6.1 The group of schools hope to work together to produce a pool of resources that will benefit the schools and their local community. The schools are located roughly as shown in the diagram below (A to E).

**FIGURE 6.1**

The schools want to maintain permanent communication with each other, available at any time during a twenty-four hour period.

- 6.1.1 One of the following kinds of connections can be used among the schools: ADSL, ISDN, Diginet or satellite.

(a) Which ONE would you recommend in the given scenario? Why? (1)

(b) Which ONE would you definitely NOT recommend in the given scenario? Why? (1)

- 6.1.2 The schools will also be connected to the internet. They have to decide on an ISP.

(a) State what the acronym *ISP* stands for and explain its function. (2)

(b) Should the schools subscribe to the same ISP? Justify your answer. (2)

- 6.2 A number of different devices are utilised to facilitate communications within the LANs and to the outside world.
- 6.2.1 What is the purpose of a router? (1)
- 6.2.2 Is it necessary for each school to purchase a router? Briefly explain your answer. (2)
- 6.2.3 The LANs in the schools will be based on ethernet technology. What is the name of the access method which is used in ethernet technology? (1)
- 6.2.4 How does an ethernet switch alleviate problems which could be caused by collisions? (2)
- 6.3 The equipment being used in some of the schools at present is out of date and much of it cannot be repaired. It is also not suitable for donation purposes.
- 6.3.1 Discuss ONE issue regarding disposal of this old equipment. (2)
- 6.3.2 When the schools were commencing plans for their networks they were offered equipment by a large company. They refused the offer.
- (a) Do you think this was a sensible decision? Motivate your answer. (1)
- (b) After some years their new equipment will also become out of date. How many years should they keep the equipment and what should they do with the old equipment? (2)
- 6.3.3 A question was raised with regard to desks, chairs and lighting in the new computer centres. Name THREE health issues that may have to be considered when designing the centres. (3)
- 6.3.4 Suggest ONE positive effect and ONE negative effect that these new centres might have on the local communities. (2)
- 6.4 One of the objectives of the new centres is to provide the opportunity for the local communities to use their facilities. They want to promote issues such as adult literacy, HIV/Aids awareness and pollution. They are trying to come up with innovative measures to further this end. Hardware and software are being looked at and not just for installation in the schools. Community centres, libraries and shopping centres are being considered as suitable locations for remote connection.
- 6.4.1 What additional equipment would you suggest that they purchase to facilitate activities in these areas of concern? Choose TWO items and state how they might be used to bring the above-mentioned issues to the attention of the community. (4)

- 6.4.2 It has been suggested that a database of information regarding HIV/Aids be provided on a website and that anonymous remote logins be provided. However, many members of the community are not computer literate. The community should feel comfortable with participating in this scheme, so use of the equipment should be as straightforward as possible.
- (a) What device would you provide to get input from the user? (1)
- (b) What device would you utilise to deliver information to a user? (1)
- 6.5 The facilities provided by the centres will be accessed by a large number of people of all ages and from all walks of life. The issue of the negative aspects of the internet is something that cannot be ignored.
- 6.5.1 Name TWO negative aspects of the internet that a user might experience when accessing websites. Explain the possible consequences in each case. (4)
- 6.5.2 E-mail can also have some negative characteristics. Spam is one example of this. Some companies specialise in dealing with spam.
- (a) What is *spam*? (1)
- (b) Name ONE way of identifying spam. (1)
- (c) Describe ONE technique for managing spam which could be implemented by a company dedicated to managing the problem. The objective is to reduce the amount of spam that you have to deal with on a daily basis. (2)
- 6.6 The schools' networks should be as accessible as possible but should be protected against unwanted intrusions.
- 6.6.1 What is the purpose of a firewall? (1)
- 6.6.2 (a) In a network, what is the purpose of the domain name service (DNS)? (2)
- (b) Give an example of a URL which demonstrates how the DNS can make the school networks easy to find on the internet. (2)
- 6.6.3 (a) What is the significance of an IP address with regard to the domain name? (2)
- (b) Give an example of an IP address (this need not necessarily be a genuine IP address). (2)

TOTAL SECTION E: **45**
GRAND TOTAL: **180**