Paper Reference(s)

6959/01

Edexcel GCE

Applied Information and Communication Technology

Unit 9: Communications and Networks

4–22 May 2009

Assessment window 3 weeks

Time: 10 hours

Materials required for examination
Short treasury tag

Items included with question papers
Cover sheet

Instructions to Candidates

Complete your candidate details on the cover sheet provided.
At the end of each session you should hand your materials in to your teacher.
At the end of the examination use a treasury tag to attach your printouts to Page 2 of the cover sheet in the correct order as shown.

Information for Candidates

There are **six** activities in this examination totalling **88** marks. **2** further marks are allocated to Standard Ways of Working giving a paper total of **90** marks.
The marks for parts of the activities are shown in round brackets: **(4)**.
There are suggested timings against each activity: e.g. **(15 minutes)**.

Advice to Candidates

Read the Scenario carefully.
Work through the activities in order.
Attempt **ALL** activities.
Label your printouts clearly as instructed.
Printing must be undertaken within the examination period.

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Turn over

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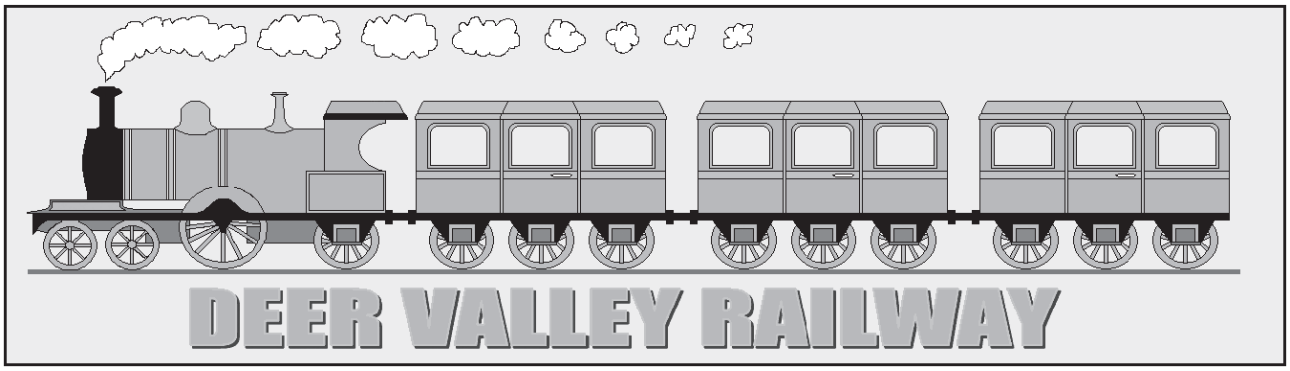
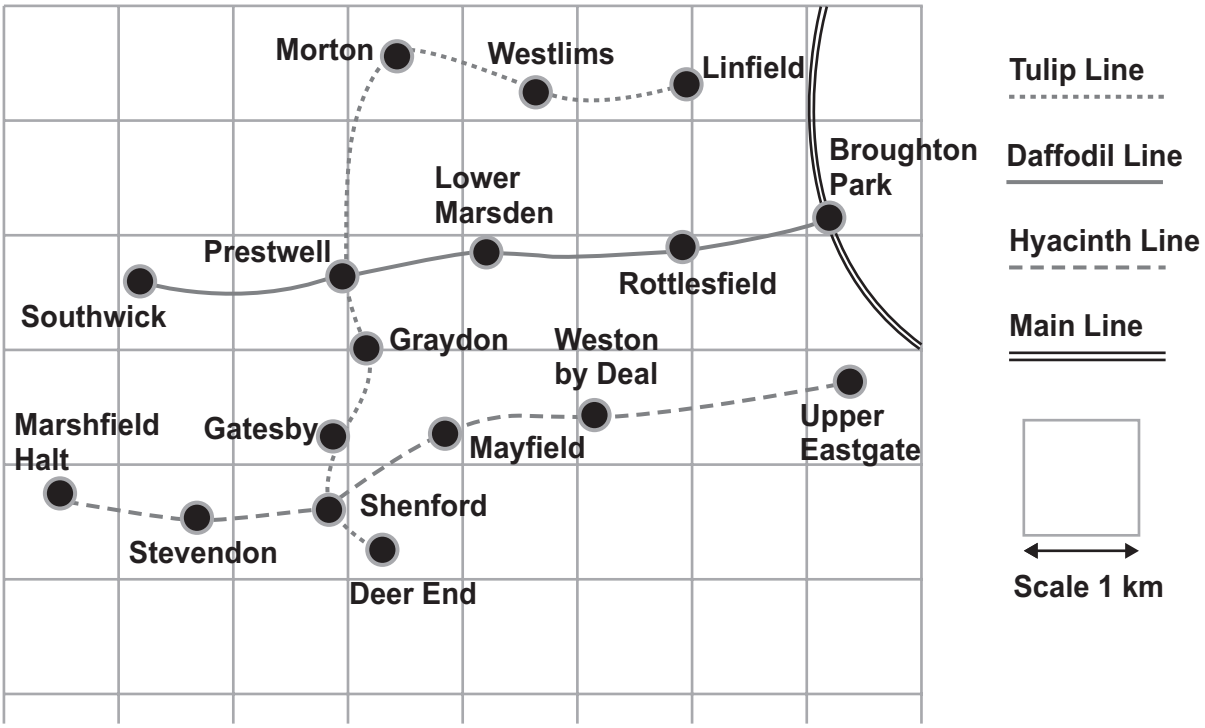


In the 1960s the government owned the entire rail network. At that time there was a movement of both passengers and freight away from rail and onto the road, which made some routes unprofitable. As a result a large number of railway lines were closed. The closures were mainly branch lines through rural areas where the number of passengers could not justify keeping the stations on those lines open.

A number of these disused lines were bought by groups of steam train enthusiasts who restored the lines. They bought and restored old steam engines and passenger carriages and ran the lines as tourist attractions. One of these lines runs through the Surrey countryside and is known as the "Deer Valley Railway" because of the number of deer which can be seen around the area. The first line was opened in 1974 and was called the Daffodil line. A large number of volunteers ensured that the track was in good order, drove the trains, sold tickets and maintained the station buildings. By 1979 two other lines, the Tulip and Hyacinth lines, had opened. The Deer Valley Railway has been running as a very successful tourist attraction ever since.

Map of the Deer Valley Railway



Recently a large number of housing developments have been built along the Daffodil line. Many residents of the developments have taken advantage of the Daffodil line because it links with a mainline service to London from Broughton Park. It was felt that a team of volunteers, no matter how dedicated, could not manage the increased number of passengers. Consequently, the "Deer Valley Railway Company" (DVRC) was set up and permanent employees now run the railway on commercial lines.

The DVRC was set up as a 'not for profit' company, so that revenue generated by the Daffodil line could be used to support the ongoing restoration of trains, buildings, and infrastructure of the three lines. The Tulip and Hyacinth lines are still run by volunteers and the manager of each line sits on the board of the DVRC. There are no immediate plans to run the Tulip and Hyacinth lines commercially.

The Deer Valley Railway is still using equipment from the days of steam trains. The only exceptions being a modern signalling system and a private digital telephone network. Both of these use trackside cables and are maintained by signals and telecoms specialists from the team of volunteers. The telephone exchange is at Broughton Park and the telecoms specialists are familiar with both DSL and ISDN technology.

The volunteers have installed at least one PC and printer at each station but there is no network and most of the IT equipment is second-hand and quite old. The volunteers use the equipment for tasks such as producing tickets, newsletters, publicity material, volunteer rosters, and tea shop menus.

All of the stations are equipped with a credit card payment terminal (chip and pin). The terminals are linked to the credit card system through a standard telephone line at each station.

The new General Manager of DVRC is George Harwell. He is 60 years old and has worked in the rail industry for over 40 years. He has a good knowledge of some specialised areas of IT such as signalling and control technology. He has used networks before but has little knowledge of how they are set up or managed, and expects such things to be handled invisibly by technical staff with a minimum of fuss for the user.

George has an office at the Broughton Park station.

Other staff based at Broughton Park are:

- the Senior Engineer, who has an office in the engine shed
- the Accountant, who shares an office with the Personnel Officer
- two secretaries, who share an office and undertake administrative work for anyone at Broughton Park who requests their services
- the Receptionist
- the Station Master, and an Assistant Station Master who share an office adjacent to the booking office.

Everyone will need their own PC.

Bulk and high quality printing at Broughton Park will be done on a shared colour laser printer. Black and white printers will be needed in reception and in each office for small jobs.

Each station on the railway will need a PC and printer in the booking office, with a connection to one of the existing credit card payment terminals.

Your project

You are an I.T. consultant and have been hired by George Harwell to help him to modernise all three lines of the DVRC. You will advise George on I.T. matters and also produce reports for submission to the board of the DVRC.

In discussions with George, you find out that his main concerns are that any system set up for the DVRC must be:

- **robust**. He is aware that an item of equipment may be used by several people, including trainees and new volunteers. Things should not break easily
- **reliable**. George emphasises that the DVRC is spread over many square kilometres and that he would rather spend a bit more money setting things up if it means he can save on technical staff salaries
- **easy to maintain**. As for the previous point, George wants users to be able to perform routine tasks such as changing printer cartridges, rather than having to call for technical support
- **user friendly**. George knows he will need I.T. staff to run things 'behind the scenes' but anything that ordinary users will operate must be simple to use
- **value for money**. This is a lesser priority than the previous points but cost must be considered therefore you will have to justify your decisions.

All word processed documents must have a header and a footer. The header must contain the activity number. The footer must contain your name, candidate number, and centre number.

A minimum font size of 10 should be used in all word processed documents, using a font suitable for business purposes.

Diagrams should be large enough for the detail to be read.

Activity 1 – Benefits of networks – (suggested time 1 hour and 20 minutes)

George thinks that it is essential for the business to connect the stations, engine sheds, and other working areas of the Daffodil line with a network. He also thinks that it would be sensible to extend the network to the Tulip and Hyacinth lines at the same time. The volunteer groups who run the Tulip and Hyacinth lines have raised objections to having networks on their lines because of the cost.

George thinks that the savings for the Tulip and Hyacinth lines should offset the cost of £5000 in five years.

George has asked you to produce some notes for him on the benefits of having the networks, with particular reference to saving more money for the Tulip and Hyacinth lines than the system will cost. At this stage detailed lists of equipment and costs **are not needed**.

Evidence to be submitted

On **one** A4 page, produce notes for George which:

- describe **six** benefits of a network which would apply to the Tulip and Hyacinth lines.

(6)

On **one** A4 page, produce notes for George which:

- explain how **four** of the benefits would save money

(4)

- indicate how these benefits might save a minimum of £5000 over a **five** year period.

(2)

(Total 12 marks)

Activity 2 – Network design and connectivity – (suggested time 1 hour 20 minutes)

The volunteers are now convinced that a network would be of benefit to the DVRC. George wishes to establish a wide area network (WAN). He wants to start with the Daffodil line and to use the existing private telephone system, where possible, to keep costs down.

George has looked on the Internet and found a site saying that WANs can use digital subscriber line (DSL) or integrated services digital network (ISDN) technology. He is not familiar with either technology and has asked you to advise him.

Produce a document for George that compares DSL and ISDN and their hardware requirements and recommends which one he should use.

Evidence to be submitted

On **one** A4 page, produce a document for George which:

- ❑ describes **three** differences between DSL and ISDN.

(6)

- ❑ states the hardware required for using each option on the Daffodil line telecoms system.

(4)

- ❑ recommends, with a justification, which one he should use.

(1)

(Total 11 marks)

Activity 3 – Components of a network – (suggested time 1 hour and 50 minutes)

Computer networks are made up of hardware devices, software, and cabling.
George has asked you to design an appropriate network solution for the Daffodil line. He requires that the network be robust, reliable, easy to maintain, user friendly and value for money.
George has a budget of £12000 for the network hardware and cabling.

As a first step in your design you must submit a budget for approval by the board. Do not include software or labour costs.

Evidence to be submitted

On **one** A4 page:

Produce a table for submission to the board which:

- ❑ identifies the hardware and cabling components to be used in your design.
- ❑ states and justifies the quantity of each component to be used in your design.
- ❑ gives a reason for the use of each component in your design.
- ❑ gives the cost of each component.
- ❑ shows the total cost of your design.

(11)

On **one** A4 page:

Explain, using any **two** of your chosen components as examples, how you have tried to comply with George's requirements that the system be:

- ❑ robust.
- ❑ reliable.
- ❑ easy to maintain.
- ❑ user friendly.
- ❑ value for money.

(6)

(Total 17 marks)

Activity 4 – Network design – (suggested time 2 hours and 30 minutes)

Having talked to George about his requirements and investigated the possible options, you now need to design an appropriate network solution for the entire Daffodil line.

- Use network design software to produce a network design for the entire Daffodil line.
- Explain and justify any decisions that you have made regarding the positioning of network devices and equipment including any additional cables.

Evidence to be submitted

On **one** A4 page each:

❑ a design for the entire Daffodil line network.

(15)

❑ notes justifying each major decision made about the network design.

(6)

(Total 21 marks)

Activity 5 – Network addressing and protocols – (suggested time 1 hour and 45 minutes)

In order to communicate with each other, each network device must be uniquely identifiable.

- Draw up a scheme for implementing IP addresses and other identification methods across the Daffodil line network. Indicate the actual IP addresses and other identification to be used.
- Explain the scheme to the signals and telecoms specialists.

Evidence to be submitted

On **one** A4 page:

Produce technical notes for the signals and telecoms specialists to include an explanation of:

- ❑ the network class to be used in the scheme and why it was chosen.

(2)

- ❑ DHCP a reason for using it and how it might be used in this scenario.

(3)

- ❑ an identification method used other than IP addresses.

(1)

- ❑ why another identification method is needed.

(1)

- ❑ how the Daffodil line WAN maps to the standard OSI model and the protocols used.

(3)

On **one** A4 page:

- ❑ produce an identification scheme, with an indication of IP addresses and other identification.

(6)

(Total 16 marks)

Activity 6 – Network management – (suggested time 1 hour and 15 minutes)

Some of the key tasks involved in managing a network are:

- system configuration
- user support and management
- usage monitoring
- fault detection
- backup and security procedures
- contingency planning
- strategic long-term planning
- software licensing
- formulating a network code of practice
- user training
- dealing with legislation.

A full time network manager will be appointed to manage the Daffodil line network. The manager will also oversee and train volunteers who will take charge of the networks on the Tulip and Hyacinth lines.

George has asked you prepare a report, outlining the duties which a network manager should be expected to perform in this situation.

Evidence to be submitted

On **one** A4 page:

- ❑ select **six** of the key tasks. State the key task you have chosen and for each, give an example of what the network manager would do when managing the Daffodil line network.

(6)

- ❑ for the remaining **five** key tasks, state the key task and for each, give an example of what the network manager would train the volunteer network managers to do on the Tulip and Hyacinth networks.

(5)

(Total 11 marks)

Standard ways of working.

All printouts must have a header and a footer. The header must contain the activity number. The footer must contain your name, candidate number and centre number.

Pages must be securely fastened to the cover sheet and in the correct order.

Minimum font size of 10 should be used for all word processed documents.

(Total 2 marks)

TOTAL FOR PAPER: 90 MARKS

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