

## Edexcel GCE

# Applied Information and Communication Technology

## Unit 9: Communications and Networks

10–28 May 2010

**Assessment window 3 weeks**

**Time: 10 hours**

Paper Reference

**6959/01**

### You must have:

Short treasury tag, cover sheet

### Instructions

- Complete your candidate details on the cover sheet provided.
- All tasks must contain your name, candidate number, centre number and activity number.
- At the end of the examination:
  - All printouts should be placed in the correct order.
  - Use a treasury tag to attach your printouts (**as shown**) to Page 2 of the cover sheet.

### Information

- The total mark for this paper is 90. There are **five** activities in this examination totalling 88 marks. **2** further marks are allocated to Standard Ways of Working.
- The marks for **each** question are shown in brackets
  - use this as a guide as to how much time to spend on each question.
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed
  - you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

- Read through 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.

Turn over ►

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## La Koralo Laguno Hotel

La Koralo Laguno hotel is situated on the tropical island of Varma Loko. The hotel has a five star rating and caters for international tourists. The hotel is situated beside a large, shallow lagoon and specialises in providing facilities for watersports. La Koralo Laguno was established in 1995 and is now closed to be refurbished and extended. The hotel's I.T. system will need to be upgraded at the same time.

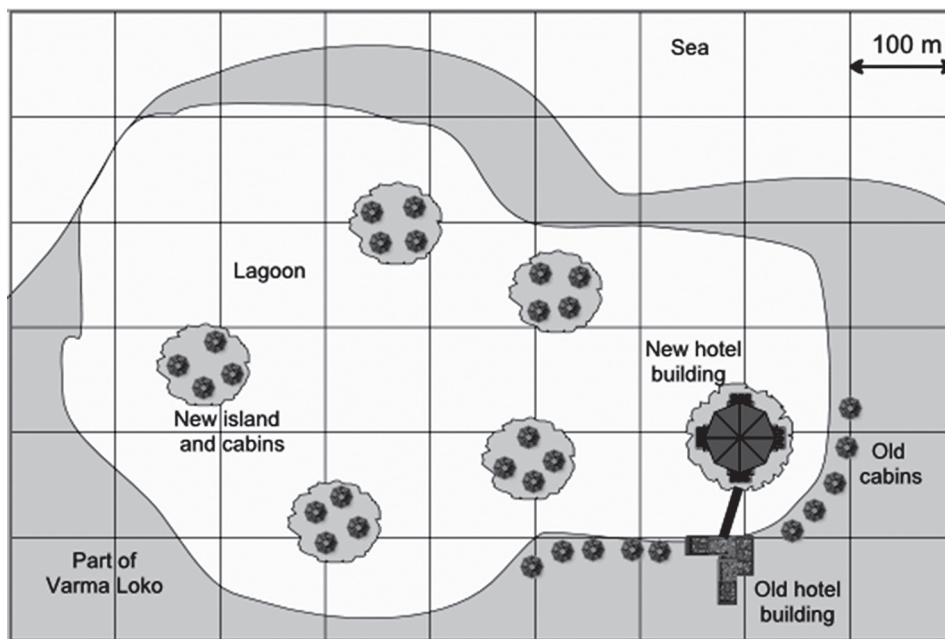
La Koralo Laguno consists of a two storey building and ten cabins, built near the water's edge. In the two storey building there are twenty double bedrooms, a restaurant and entertainment complex, and the I.T. and administration centre. Each cabin has two double bedrooms, a bathroom, a lounge, and a kitchen.

The extension of the hotel facilities will be built on artificial islands in the lagoon.

It will consist of:

- a new building, housing a shop and improved restaurant and entertainment facilities, linked to the old hotel building by a bridge
- twenty new cabins. The artificial islands with cabins will not be linked by bridges.

The current layout of the hotel and the proposed developments are shown on the sketch map.



Guests will be able to use canoes, rowing boats, and sailboards to access the islands. A water taxi service will be available for transporting luggage and those guests who are not feeling energetic enough to move under their own power.

At present the I.T. and administration centre is located on the ground floor of the old hotel building. It is an open plan area, measuring 10 metres by 20 metres, in the wing furthest away from the lagoon. It will be upgraded but will remain where it is.

The hotel LAN runs from an NT4 server. There are eight PCs used by the hotel staff. There are two black and white laser printers and a colour inkjet. The hotel's Internet connection was upgraded from a telephone dial-up system to a satellite dish last year. The LAN is cabled with CAT 5 and is confined to the old hotel building since some of the old cabins were beyond the maximum reach of a Cat 5 cable when they were built.

All of the old and new guest accommodation will be included in the new network and most of the old equipment is likely to be scrapped.

The project manager, Viro De Ordoni, has hired you to advise on the design and construction of the new I.T. system. The project has a multi-million pound budget and Viro has indicated that money and manpower will not be a problem. He has also told you that there are two important constraints that you must consider.

1. **A shortage of skilled labour.** The Varma Loko government has decreed that local labour must be used in the project. There are well-qualified electricians on the island and the hotel's network staff are also available. No-one has experience of anything other than copper cable or simple WiFi connections, therefore any equipment that you select must be simple to set up and operate. Copper cable and WiFi are Viro's preferred solutions and he is unlikely to change his mind about this.
2. **Inexperienced users.** Anything that may be used by a guest must be robust and intuitive to use, and be visually appealing.

## Instructions to Candidates

All 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 type suitable for business purposes.

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

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### \*Activity 1 – Network Management (suggested time 1 hour and 20 minutes)

The system has already been shut down. The server and PCs are available as standalone computers and will be sold as working machines. Viro tells you that although the hotel operated a backup system he cannot be sure that the backup is complete and up-to-date.

Prepare a two part document for Viro to help him deal with these issues.

#### Part 1

Produce a set of instructions for the management staff to follow in order to find and save as much as possible of the hotel records **before** the machines are sold.

#### Part 2

Explain **two** different methods of preventing data recovery **after** the machines are sold.

Include a recommendation of which method Viro should choose, with a reason.

(12)

Pay particular attention to the quality of your written communication.

#### Evidence to be submitted

On **one** word processed A4 page:

- A two part document for Viro.

**Marks will be awarded for the Quality of your Written Communication.**

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**(Total for Activity 1 = 12 marks)**

## Activity 2 – Network connectivity (suggested time 2 hours 20 minutes)

The new system will be run from the I.T. and administration centre.

Viro has asked you to advise him about connecting the I.T. and administration centre to the islands and old cabins, by using WiFi links.

There is a legal constraint that WiFi signals must be restricted to the hotel property. Assume this is the area covered by the sketch map.

Viro has been looking at hardware specifications and has decided that all the transmission equipment must comply with EU (European Union) standards.

EU regulations limit WiFi equipment to:

- dBi rating of 2.14
- 20 dBm
- 100mW.

These values give a maximum range of about 100 metres. He wants to know what the different units mean.

- (a) Research dBi, dBm, and mW and produce notes to explain to Viro what they are and how they relate to each other. (8)

Viro is aware that the islands are much more than 100 metres away from the I.T. and administration centre. He thinks that suitable antennae will allow the signals to cover the distance. He asks you to advise him on antennae.

- (b) (i) Produce diagrams to show a standard isotropic WiFi antenna and **two** other WiFi antenna types. (3)
- (ii) State how each of the three antenna types affects signal coverage. (3)

Viro has read that a number of factors can affect the maximum theoretical range of WiFi communications. The impact of factors such as weather conditions cannot be reduced. However, action can be taken to reduce the impact of other factors.

- (c) Produce notes on **three** factors, other than antenna type, which would impact on the communication range in this scenario. Do not include factors whose impact cannot be reduced. In each case identify an action that could be taken to reduce the impact. (6)

### Evidence to be submitted for (a), (b) and (c)

On **one** word processed A4 page each:

- Notes to explain dBi, dBm, and mW, what they are and how they relate to each other.
- Diagrams to show a standard isotropic WiFi antenna and two other WiFi antenna types and statements of how each of the three antenna types affects signal coverage.
- Notes on three factors that impact on communication range and actions that could be taken to reduce their impact.

**(Total for Activity 2 = 20 marks)**

### Activity 3 – Components of a network – (suggested time 2 hour and 20 minutes)

At a meeting with Viro you discuss the new I.T. system and agree that the system should be modular so that:

- each cabin, old and new, will have the same layout of I.T. equipment. This equipment will be located in the lounge.
- each artificial island with cabins will have the same communications equipment
- each group of old cabins will be treated, as closely as possible, as one of the islands
- each hotel bedroom will have an identical layout of I.T. equipment.

The equipment in the cabins and hotel bedrooms must allow guests to use a single system to access:

- films on demand
- video / PC games on demand
- the hotel intranet and selected Internet sites
- internal and external telephone services using VoIP.

(a) Produce a table for Viro which identifies the hardware and cabling components to be used in **one** cabin, giving a reason for each component.

(7)

(b) Choose **three** items from your answer to part (a). For each one state how you would make it meet at least one of the requirements that anything that may be used by a guest must be:

- robust
- intuitive to use
- visually appealing.

(6)

Each artificial island has four cabins which need to be linked to the system.

(c) Produce a table for Viro which identifies the **extra** hardware and cabling components to be used on **one** island, giving a reason for each component.

(3)

It was also agreed that:

- the server and backup server will be located in the I.T. and Administration Centre
- there will be 12 workstations in the I.T. and Administration Centre, in four departmental groups of three: Management, Finance, Marketing, and I.T.
- the 12 workstations will share two colour laser printers
- a new reception area will be created on the ground floor of the old building. It will overlook the bridge to the new building
- the reception area will have three workstations sharing a black and white laser printer
- the entertainment complex, shop, and restaurant will all need network connections
- the entertainment complex, shop, and restaurant managers will have their own budgets and will purchase the specialist systems that they require. These must connect to standard network devices.

(d) Using these requirements as a guide, produce a table for Viro which identifies any other hardware and cabling components to be used in your design.

(4)

### **Evidence to be submitted**

On **one** word processed A4 page each:

- A table for Viro which identifies the hardware and cabling components to be used in one cabin, giving a reason for each component.
- Statements about how you would make each of three items meet **one or more** of the requirements.
- a table for Viro which identifies the extra hardware and cabling components to be used on one island, giving a reason for each component.
- a table for Viro which identifies any other hardware and cabling components to be used in your design. Specify the number or amount of each item.

**(Total for Activity 3 = 20 marks)**

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#### Activity 4 – Network design – (suggested time 3 hours)

Having talked to Viro about his requirements and investigated the possible options, you now need to design an appropriate network solution for the hotel. There is a constraint that WiFi signals must be restricted to the hotel property. Assume that this is the area covered by the map.

(a) Use network design software to produce a network design for the complete project.

**Note.** In Activity 3 it was identified that the design is modular and therefore you need to show:

- Detail for one hotel bedroom or cabin
- The method of connection to the network for the other bedrooms and cabins
- Detail for one artificial island with cabins
- The method of connection to the network for the other artificial islands
- Detail for one group of old cabins
- The method of connection to the network for the other group
- Detail for one group of three workstations
- The method of connection to the network for the other groups.

You should show all other cables, connections and devices.

(16)

(b) Explain and justify any decisions that you have made regarding the positioning of network devices and equipment other than the long range WiFi links.

(4)

(c) Explain and justify any decisions that you have made regarding WiFi links, antenna types, and any other factors that affect WiFi coverage.

(6)

#### Evidence to be submitted for (a)

On **one** A4 page of computer output:

- Your network design.

#### Evidence to be submitted for (b) and (c)

On **one** word processed A4 page:

- Notes justifying each major decision made with regard to the network design other than the long range WiFi links.
- Notes justifying each major decision with regard to WiFi links, antenna types, and any other factors that affect WiFi coverage.

**(Total for Activity 4 = 26 marks)**



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

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

(a) Viro would like an explanation of:

- why a class C should be used in the scheme
- static and dynamic addresses
- reservations
- scopes.

Produce brief notes for this purpose.

(4)

(b) Draw up a scheme for implementing IP addresses across the network. Include justifications for your decisions.

(6)

#### Evidence to be submitted for (a) and (b)

On **one** word processed A4 page each produce:

- Explanatory notes for Viro.
- An identification scheme including justifications for your decisions.

(Total for Activity 5 = 10 marks)

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#### Standard ways of working.

**All printouts must contain the activity number, 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**

(Standard ways of working = 2 marks)

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**TOTAL FOR PAPER = 90 MARKS**

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