OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE ADDITIONAL APPLIED SCIENCE A

A326/02

Communications (Higher Tier)

Candidates answer on the question paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Wednesday 22 June 2011
Morning

Duration: 45 minutes

A326020

OCE/26257

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

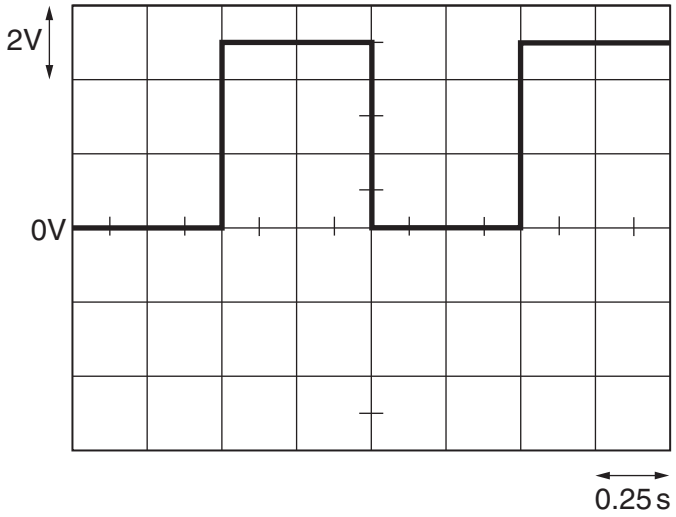
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Here is an oscilloscope trace of a digital signal.



(a) How can you tell that the signal is a **digital** one?

.....

..... **[1]**

(b) The oscilloscope is set up with 0 V at the centre of the screen.

Calculate the maximum voltage of the signal.

maximum voltage = ... V **[1]**

(c) Calculate the time for one cycle (period) of the signal on the screen.

Then draw one straight line to link your value of the **period** to its **frequency**.

period	**frequency**
0.25 s	0.5 Hz
0.50 s	1.0 Hz
1.00 s	2.0 Hz
2.00 s	4.0 Hz

[2]

(d) Digital signals are used a lot in communications.

This is because they do not lose their quality as they travel.

State **two** other advantages of using digital signals for communication.

.....

.....

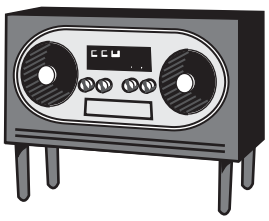
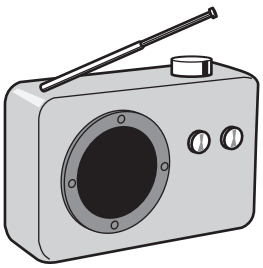
.....

..... **[2]**

[Total: 6]

2 Jim plans to buy a new radio receiver.

(a) He finds these details in a catalogue.

receiver name	AW36	LH56	ZB02	SD99
cost	£42	£32	£36	£27
size	stand alone 	table top 	table top 	pocket 
weight	75 N	20 N	15 N	2 N
channels	DAB only	LW, MW and FM	FM only	MW and FM
power source	mains	mains or battery	battery	battery
sound power	42 W	10 W	1.5 W	0.1 W

(i) Jim wants a radio that he can easily carry around with him.

Which one should he choose? Give **two** reasons for your answer.

.....

.....

..... **[1]**

(ii) Jim wants a receiver which is cheap to run and picks up FM channels.

Which receiver should he choose? Give a reason for your answer.

.....

..... **[1]**

(b) Here is a block diagram for a radio receiver.

(i) Complete the diagram. Choose from these words.

amplifier **demodulator** **microphone** **modulator** **tuner**

[2]

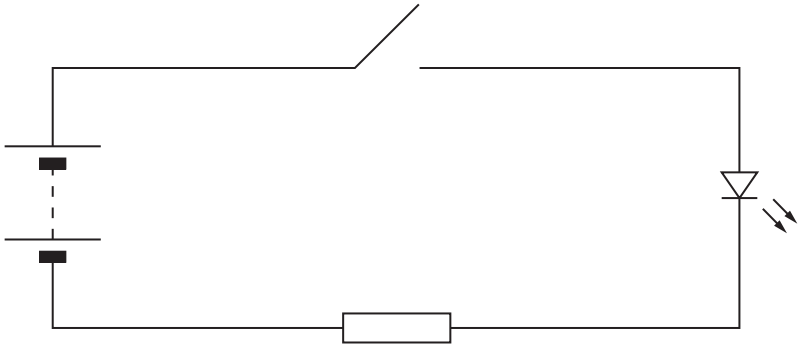
(ii) What do the arrows in the diagram represent?

.....

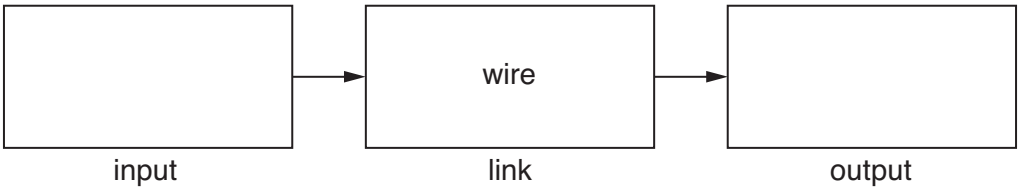
..... **[1]**

[Total: 5]

3 Bob builds this simple signalling circuit. It uses flashes of light to carry Morse code.



(a) Complete this block diagram for the signalling circuit.



[2]

(b) Bob uses the circuit to communicate with Sally in another room, using Morse code.

Explain how he could measure the **error rate** for the system.

.....

.....

.....

..... **[2]**

(c) Morse code is an example of a **digital** code.

Give another example of a **digital** code.

.....

..... **[1]**

[Total: 5]

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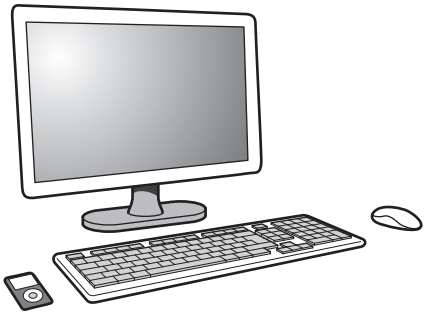
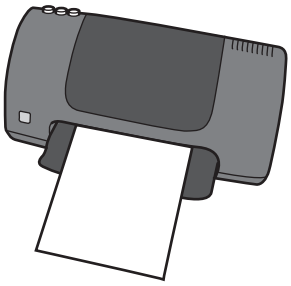
4 Saleem has a wireless printer for his computer system.

Radio waves pass information from the computer to the printer.





(a) Describe how information about a document is passed from the computer to the printer. Use these words in your answer.

carrier wave **demodulate** **modulate**

.....

.....

.....

..... **[3]**

(b) The computer compresses the data before transmitting it to the printer.

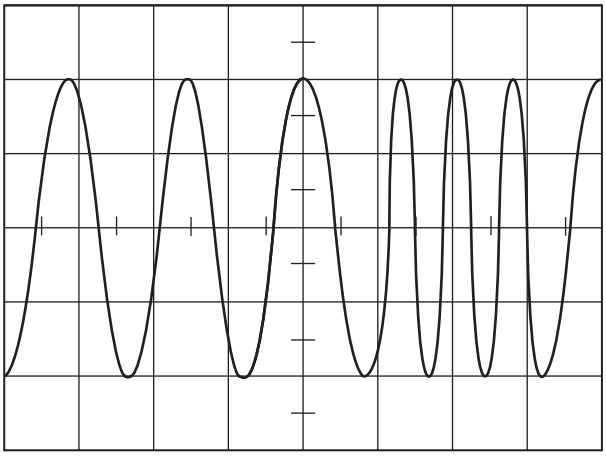
What does compression do to the data? Suggest why it is done.

.....

.....

..... **[2]**

(c) Here is an oscilloscope trace of the signal as it arrives at the printer.



Name the type of modulation used in the system.

..... **[1]**

[Total: 6]

5 Pete is a policeman. He uses the radio in his car to communicate with other police.

(a) The radio set encrypts Pete's messages before sending them out.

Suggest why police messages are **encrypted**.

.....

..... **[1]**

(b) Pete's radio can receive video signals and display pictures on a screen.

The video signal bit rate is 2400 bits per second.

Each picture has 60 rows, with 100 pixels in each row.

Each pixel requires 2 bits of information.

Do calculations to explain why it takes 5 seconds to receive one picture.

Show your working clearly.

[2]

(c) The video signal bit rate is low because Pete's radio channel has a small bandwidth.

Explain what is meant by **bandwidth**.

.....

.....

..... **[2]**

(d) Pete's radio channel uses a frequency similar to that of television broadcasts.

(i) Here are some radio frequencies.

Put a (ring) around the one which could be used for Pete's radio.

5 kHz **500 MHz** **5 GHz** **500 GHz**

[1]

(ii) Explain why the police and other radio broadcasters need to be licensed.

.....

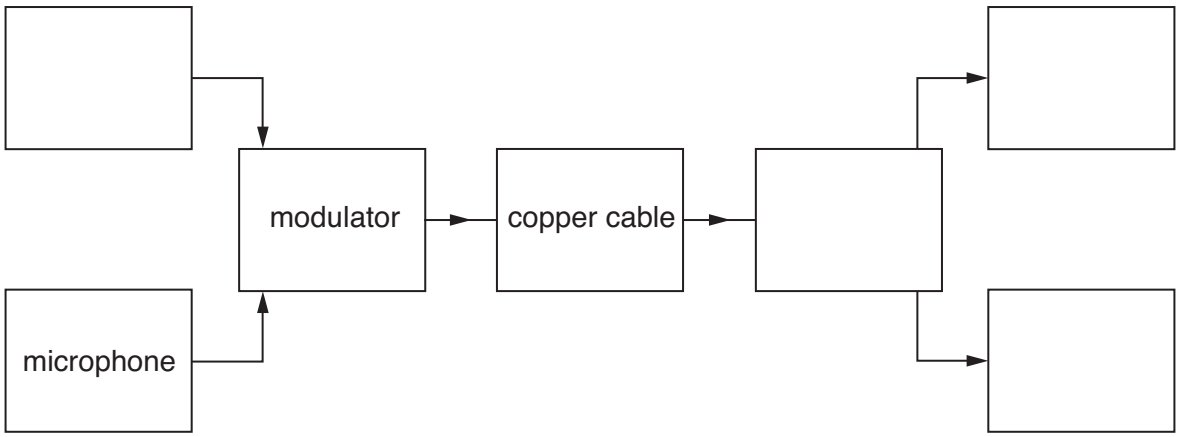
.....

..... **[2]**

[Total: 8]

6 Here is the block diagram for a simple television security system.

It carries signals from one room to another in the same building.



(a) Complete the block diagram for this television system.

[3]

(b) An **analogue** signal is transmitted along the copper cable.

Give **two** advantages of using an analogue signal instead of a digital one.

.....

.....

.....

..... **[2]**

(c) A modern TV security system uses optical fibre instead of copper cable.

Give another example of a communication system which uses optical fibre as the link.

.....

..... **[1]**

[Total: 6]

END OF QUESTION PAPER