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A326/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL APPLIED SCIENCE A

Communications (Higher Tier)

FRIDAY 20 JUNE 2008

Morning
Time: 45 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
                          Ruler (cm/mm)

Candidate Forename		Candidate Surname	

Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **36**.

FOR EXAMINER'S USE

Qu.	Max	Mark
1	6	
2	7	
3	5	
4	8	
5	5	
6	5	
TOTAL	**36**	

This document consists of **11** printed pages and **1** blank page.
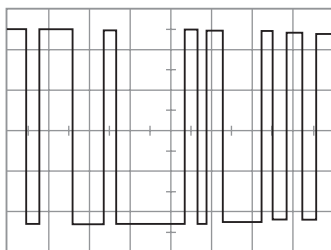
[Turn over

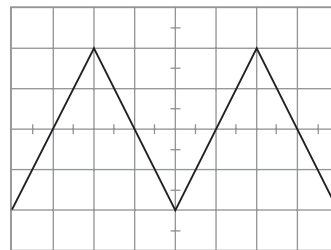Answer **all** the questions.

1 John is a disc jockey.

(a) He likes to play old music recorded on vinyl discs.
The old music is recorded on the disc as an **analogue** signal.
He knows that music sometimes sounds better when it is recorded as a **digital** signal.

(i) Here are four oscilloscope traces of signals.

A

B
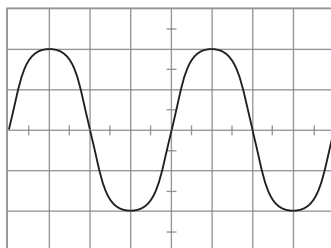
C
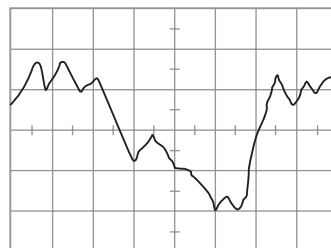
D

Which one is a **digital** signal?

answer .... [1]

(ii) Why might music sound better when it is recorded as a digital signal?

....

.... [1]

(iii) Suggest another advantage of recording music as a digital signal.

....

.... [1]

(b) John decides to transfer part of his favourite vinyl recording to the hard disc of his computer.

The analogue recording is converted into a digital signal.
This is stored as a file in the computer.

Here is some information about the conversion process.

digital sample	12 bits
sample rate	42 000 samples per second
length of recording	15 seconds

(i) Show that 504 000 bits are needed to store each second of the recording.

[1]

(ii) How many bits are needed to store 15 seconds of the recording?

answer .... bits [1]

(iii) How would you convert this file size from bits into **bytes**?

....

.... [1]

[Total: 6]

[Turn over

2 Sue uses an oscilloscope to test a radio transmitter.
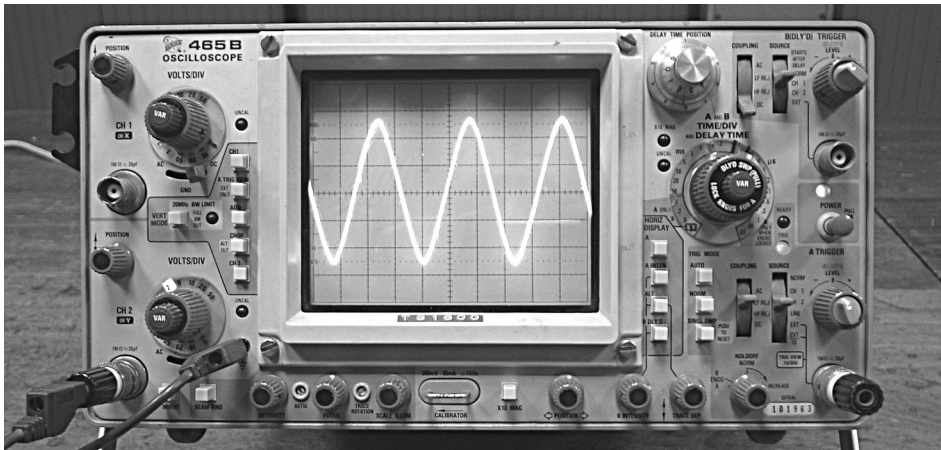
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(a) Here is one of the signals that she observes.

Use the information to calculate:

(i) the amplitude of the signal.

amplitude = ... V [1]

(ii) the frequency of the signal.

frequency = ... Hz [2]

(b) Here is a block diagram for the radio transmitter.

```
microphone  ──→┐
               ├──→  modulator  ──→  amplifier  ──→  aerial
oscillator  ──→┘
```
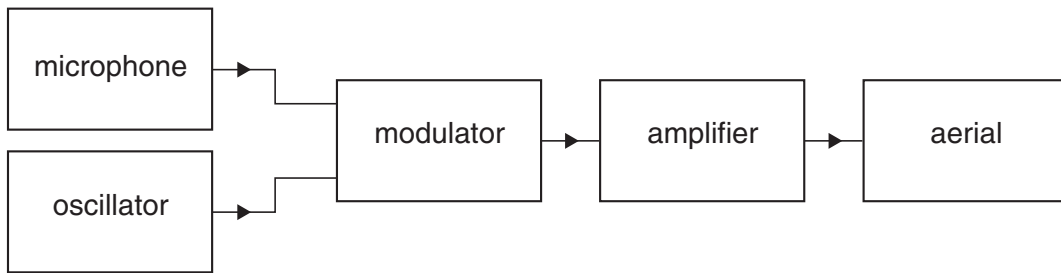
(i) Describe the function of the amplifier.

....

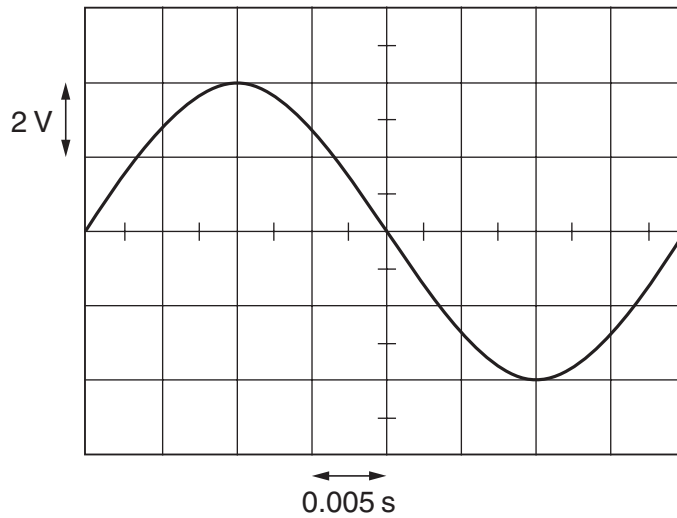...

.... [2]

(ii) Describe the function of the aerial.

....

....

.... [2]

[Total: 7]

[Turn over

3 The circuit diagram shows an integrated circuit powered by a 6 V battery.
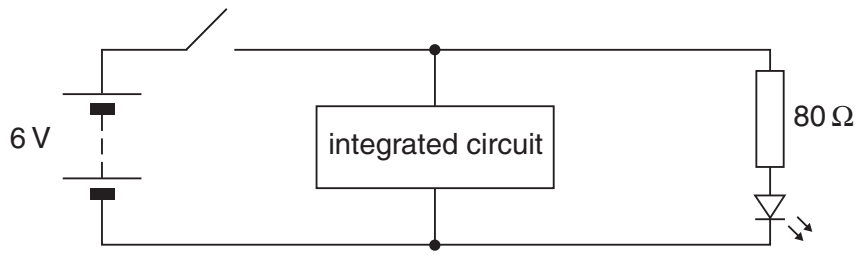
(a) The switch is closed to power the integrated circuit.

The voltage across the LED is 2 V.

(i) Explain why the voltage across the resistor is 4 V.

....

.... [1]

(ii) Calculate the current in the 80 Ω resistor.

Use $I = \dfrac{V}{R}$.

current = ... A [2]

(b) The switch needs a current rating of 1 A.

Suggest why this needs to be much greater than the current in the LED.

....

....

....

.... [2]

[Total: 5]

4 One fax machine sends a copy of a document to another fax machine.
An optical fibre links the two machines.

first fax machine   second fax machine
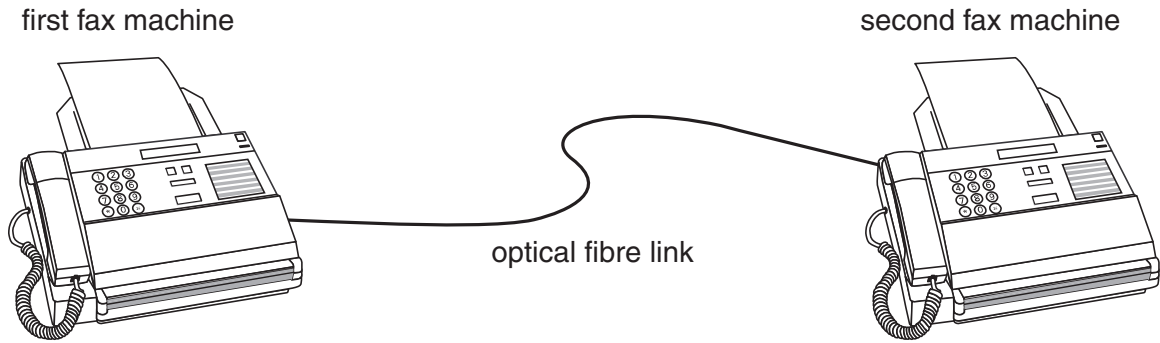
optical fibre link

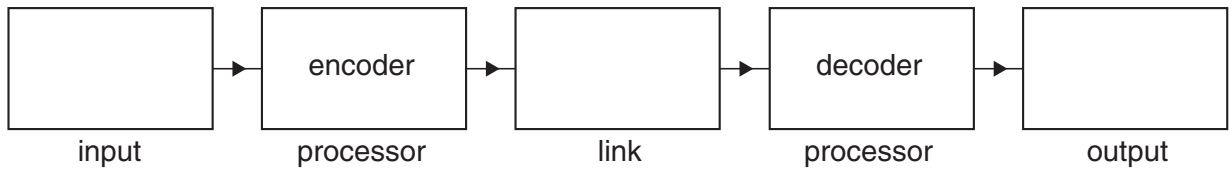**(a)** Complete this block diagram for the system.

	encoder		decoder	
input	processor	link	processor	output

[3]

(b) Describe the function of the input block and encoder.

Include the form of the signal passed onto the link.

....

....

....

....

.... [3]
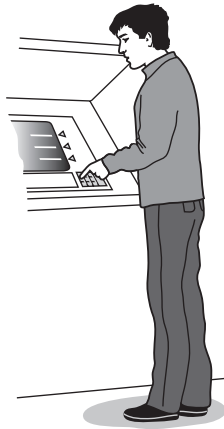
(c) The link between the fax machines could be made with copper wires instead of optical fibre. This would cost less.

Suggest **advantages** of using optical fibre instead of copper wire for the link.

....

....

.... [2]

[Total: 8]

[Turn over

5 Matt gets some money from a cash machine.

(a) He presses buttons on a keyboard to enter his security number.

The number is sent across the internet to his bank.

(i) Explain why the number is **encrypted** before it enters the internet.

....

....

.... [2]

(ii) The number can only be encrypted if it is in digital form.

This also means that it can be **compressed**.

Explain the advantages of compressing digital information.

....

....

.... [2]

(b) The cash machine uses programmable electronic systems.

Why does this reduce the cost of the machine?

....

.... [1]
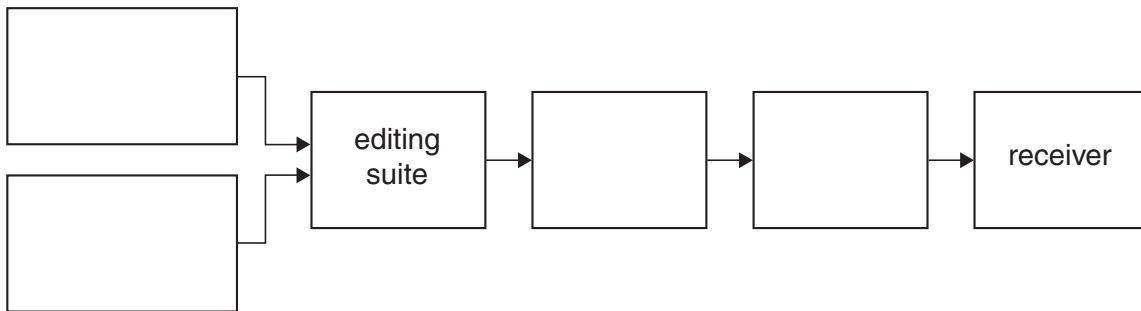
[Total: 5]

6 Live outside broadcasts allow people all over the world to watch a sporting event.

(a) Here is an incomplete block diagram for a live outside TV broadcast system.

Complete the block diagram. Use words from this list.

cameras   microphones   transmitter   satellite

[2]

(b) The system is managed by the people in the editing suite.

Describe what these people do to produce the broadcast.

....

....

....

....

.... [2]

[Turn over

(c) The receiver contains an aerial.

What is the best type of aerial for the receiver?

Put a (ring) around the correct answer.

                dish   **dipole**   **rod**   **wireless**

[1]

[Total: 5]

END OF QUESTION PAPER

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