

Communication

Question paper 1

Level	International A Level
Subject	Physics
Exam Board	CIE
Topic	Communication
Sub Topic	
Paper Type	Theory
Booklet	Question paper 1

Time Allowed: 60 minutes

Score: /50

Percentage: /100

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 (a) Information may be carried by means of various channels of communication.

Name examples, one in each case, of devices where information is carried to the device using

(i) a wire pair,

..... [1]

(ii) a coaxial cable,

..... [1]

(iii) microwaves.

..... [1]

(b) State two advantages of optic fibres as compared with coaxial cables for long-range communication.

1.

2.

[2]

(c) An optic fibre has length 62 km and an attenuation per unit length of 0.21 dB km^{-1} .
The input power to the fibre is P . At the receiver, the noise power is $9.2 \mu\text{W}$.
The signal-to-noise ratio at the receiver is 25 dB.

(i) Calculate the ratio, in dB, of the input power P to the noise power at the receiver.

ratio = dB [2]

(ii) Use your answer in (i) to determine the input power P .

$P = \dots\dots\dots$ W [2]

2 One channel of communication is by the use of a coaxial cable. Such a cable is illustrated in Fig. 11.1.

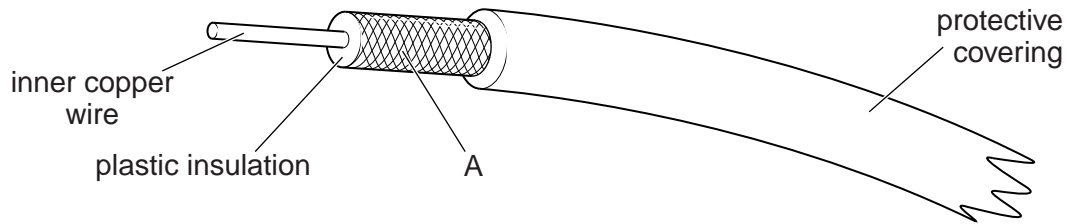


Fig. 11.1

(a) (i) Suggest the material from which the component labelled A on Fig. 11.1 is made.

.....[1]

(ii) Suggest two functions of the component labelled A.

1.

.....

2.

.....

[2]

(b) When a signal travels along the coaxial cable, it is attenuated.

(i) State the meaning of *attenuation*.

.....

.....[1]

(ii) State and explain why attenuation is frequently measured in decibels (dB).

.....

.....

.....[2]

- (c) A television aerial is connected to a receiver using a coaxial cable of length 11 m. The attenuation per unit length of the cable is 190 dB km^{-1} .

Calculate the ratio

$$\frac{\text{output signal from coaxial cable}}{\text{input signal to coaxial cable}} .$$

ratio =[3]

4 (a) Information may be carried by different channels of communication.

State one application, in each case, where information is carried using

(i) microwaves,

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

(ii) coaxial cables,

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

(iii) wire pairs.

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

(b) A station on Earth transmits a signal of initial power 3.1 kW to a geostationary satellite. The attenuation of the signal received by the satellite is 190 dB.

(i) Calculate the power of the signal received by the satellite.

power = kW [2]

(ii) By reference to your answer in (i), state and explain the changes made to the signal before transmission back to Earth.

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

5 (a) Distinguish between an *analogue* signal and a *digital* signal.

analogue signal:

.....

digital signal:

.....

[2]

(b) An analogue-to-digital converter (ADC) converts whole decimal numbers between 0 and 23 into digital numbers.

State

(i) the minimum number of bits in each digital number,

number of bits = [1]

(ii) the digital number representing decimal 13.

..... [1]

(c) An analogue signal is digitised before transmission. It is then converted back to an analogue signal after reception.

State and explain the effect on the reproduction of the signal when the number of bits in the analogue-to-digital converter (ADC) and the digital-to-analogue converter (DAC) is increased.

.....

.....

.....

..... [3]

6 In a mobile phone system, the country is divided into a number of cells, each with its own base station.

State and explain

(a) why the country is divided into cells,

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

(b) two reasons why the base stations operate on UHF frequencies.

1.
.....
.....
2.
.....
..... [4]

7 The signal from a microphone is to be transmitted in digital form. A block diagram of part of the transmission system is shown in Fig. 13.1.



Fig. 13.1

(a) Suggest two advantages of the transmission of a signal in digital form rather than in analogue form.

- 1.
.....
- 2.
.....

[2]

(b) State the function of the parallel-to-serial converter.

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

(c) In a particular telephone system, the sampling frequency is 8 kHz. In the manufacture of a compact disc, the sampling frequency is approximately 44 kHz.

Suggest and explain why the sampling frequency is much higher for the compact disc.

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