

Communication

Question paper 7

Level	International A Level
Subject	Physics
Exam Board	CIE
Topic	Communication
Sub Topic	
Paper Type	Theory
Booklet	Question paper 7

Time Allowed: 52 minutes

Score: /43

Percentage: /100

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

1 (a) (i) Describe what is meant by *frequency modulation*.

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

(ii) A sinusoidal carrier wave has frequency 500kHz and amplitude 6.0V. It is to be frequency modulated by a sinusoidal wave of frequency 8 kHz and amplitude 1.5V. The frequency deviation of the carrier wave is 20 kHz V⁻¹. Describe, for the carrier wave, the variation (if any) of

1. the amplitude,

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

2. the frequency.

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

(b) State two reasons why the cost of FM broadcasting to a particular area is greater than that of AM broadcasting.

1

.....

2

..... [2]

2 (a) Optic fibre transmission has, in some instances, replaced transmission using co-axial cables and wire pairs.

Optic fibres have negligible cross-talk and are less noisy than co-axial cables.

Explain what is meant by

(i) cross-talk,

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

(ii) noise.

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

(b) An optic fibre has a signal attenuation of 0.20 dB km^{-1} .

The input signal to the optic fibre has a power of 26 mW . The receiver at the output of the fibre has a noise power of $6.5 \mu\text{W}$.

Calculate the maximum uninterrupted length of optic fibre given that the signal-to-noise ratio at the receiver must not be less than 30 dB .

length = km [5]

3 Fig. 10.1 shows the variation with frequency f of the power P of a radio signal.

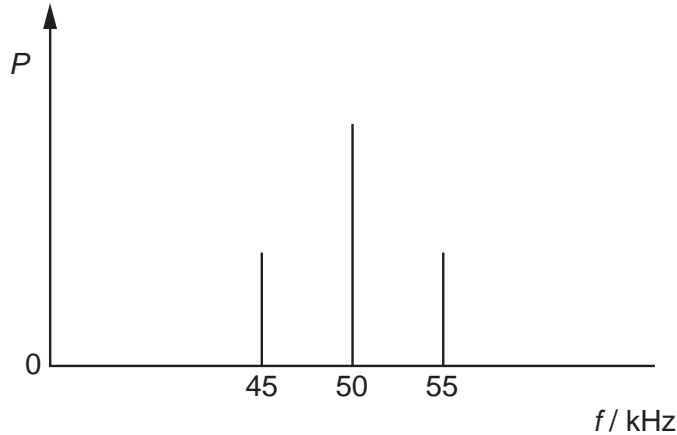


Fig. 10.1

(a) State the name of

(i) the type of modulation of this radio signal,

.....[1]

(ii) the component of frequency 50kHz,

.....[1]

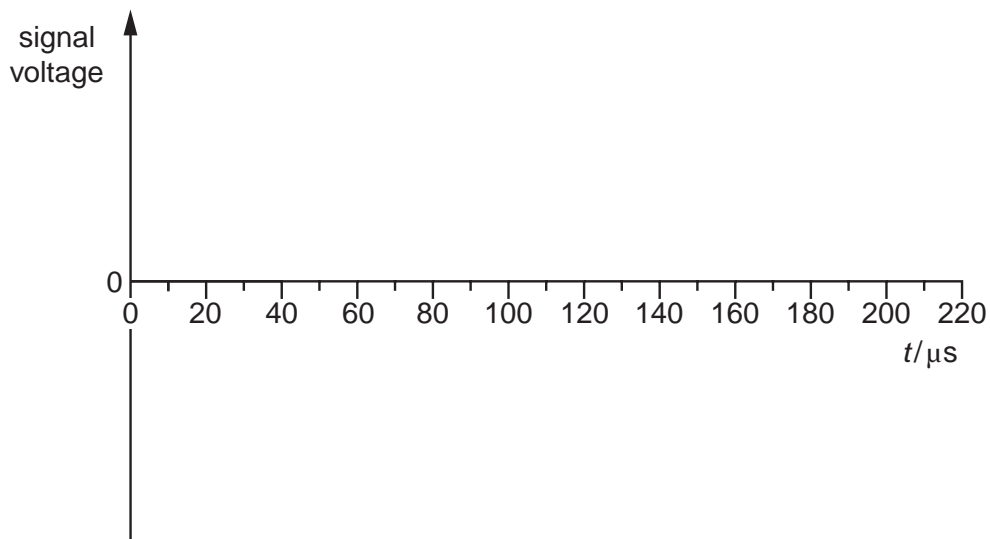
(iii) the components of frequencies 45 kHz and 55 kHz.

.....[1]

(b) State the bandwidth of the radio signal.

bandwidth = kHz [1]

(c) On the axes of Fig. 10.2, sketch a graph to show the variation with time t of the signal voltage of Fig. 10.1.



[3]

Fig. 10.2

- 4 In a cellular phone network, a country is divided into a number of cells, each with its own base station.
Fig. 11.1 shows a number of these base stations and their connection to a cellular exchange.

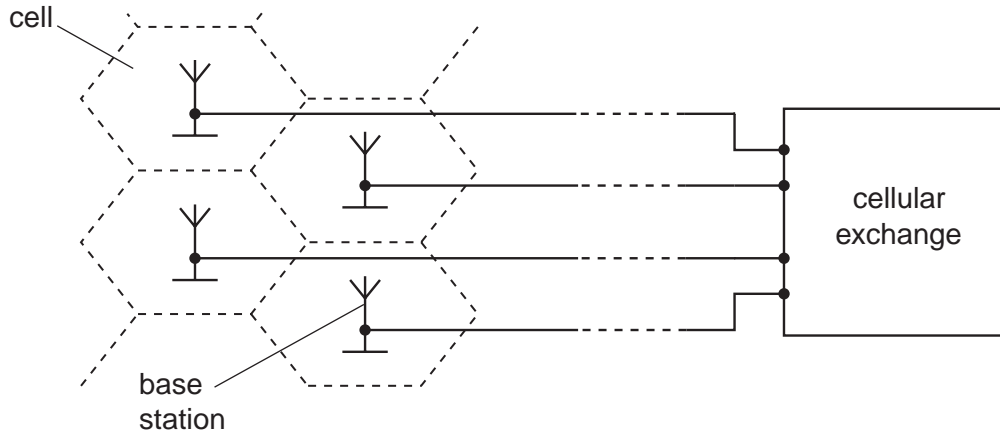


Fig. 11.1

- (a) Suggest and explain why the country is divided into a number of cells.

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

- (b) Outline what happens at the base station and the cellular exchange when a mobile phone handset is switched on, before a call is made.

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.....
.....
.....
.....[4]

- 5 An analogue signal is sampled at a frequency of 5.0 kHz. Each sample is converted into a four-bit number and transmitted as a digital signal. Fig. 10.1 shows part of the digital signal.

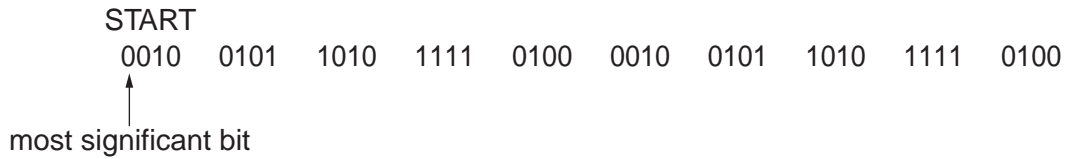
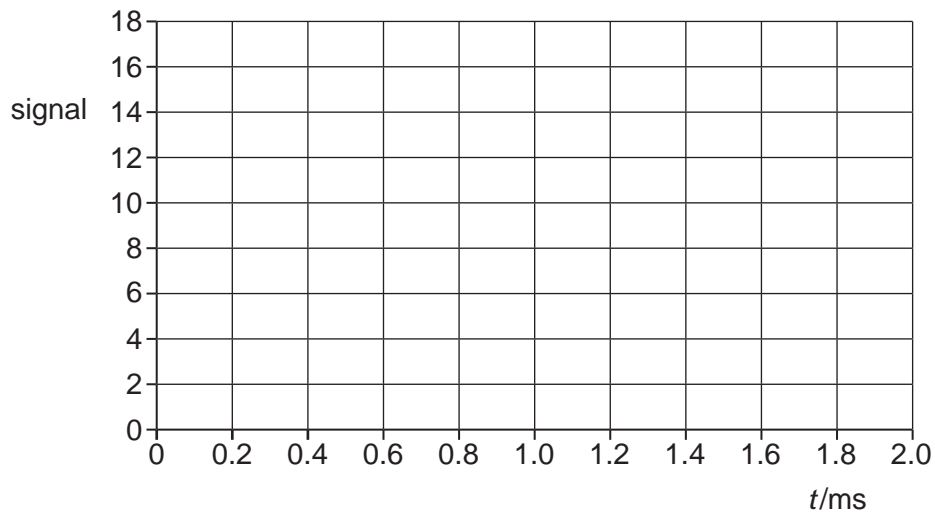


Fig. 10.1

The digital signal is transmitted and is finally converted into an analogue signal.

- (a) On the axes of Fig. 10.2, sketch a graph to show the variation with time t of this final analogue signal.



[4]

Fig. 10.2

- (b) Suggest two ways in which the reproduction of the original analogue signal could be improved.

1.
.....

2.
..... [2]

- 6 (a) Fig. 11.1 is a block diagram showing part of a mobile phone handset used for sending a signal to a base station.

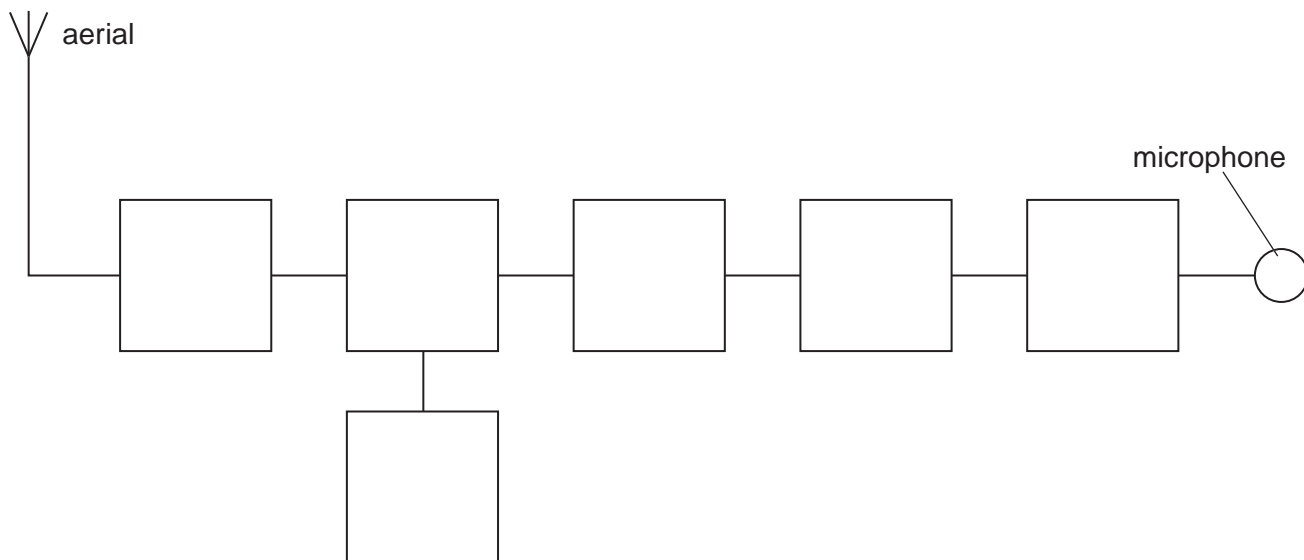


Fig. 11.1

Complete Fig. 11.1 by labelling each of the blocks. [3]

- (b) Whilst making a call using a mobile phone fitted into a car, a motorist moves through several different cells. Explain how reception of signals to and from the mobile phone is maintained.

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..... [4]