



General Certificate of Education

Electronics 5431/6431

(ELE5) Communications Systems

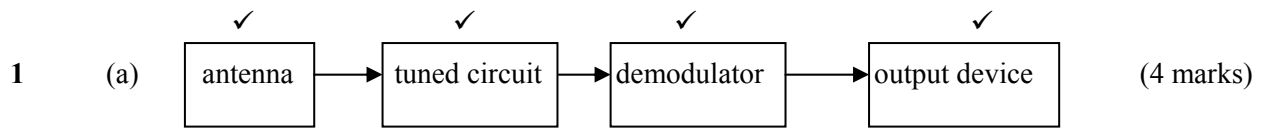
Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

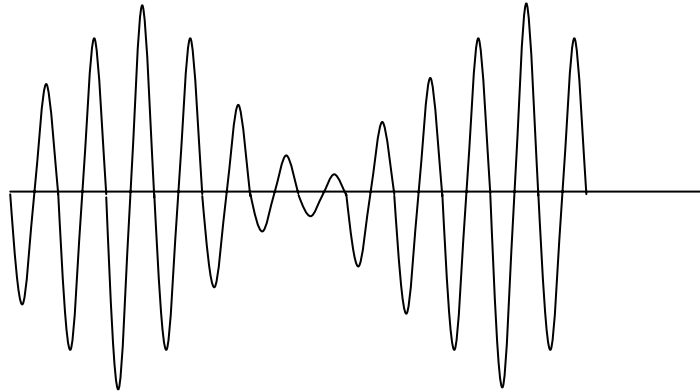
ELE5 – Communications Systems



- (b) (i) $\lambda = v/f = 3 \times 10^8 / 0.6 \times 10^6 = 500 \text{ m}$ ✓
 (ii) $500 / 2 = 250 \text{ m}$ ✓
 (iii) $L = 1 / 4 \pi^2 f^2 C =$ ✓
 $1 / 40 \times 0.36 \times 10^{12} \times 500 \times 10^{-12} =$ ✓
 $140 \mu\text{H}$ ✓ (6 marks)

Total 10 marks

2 (a)

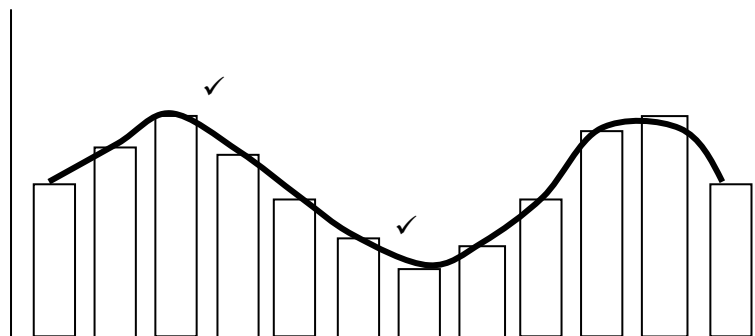


- In step ✓
 Same f as af ✓
 Carrier wave compares ✓
 Symmetrical about axis ✓ (4 marks)

- (b) $2 \times 4 \text{ kHz} = 8 \text{ kHz}$ ✓ (2 marks)

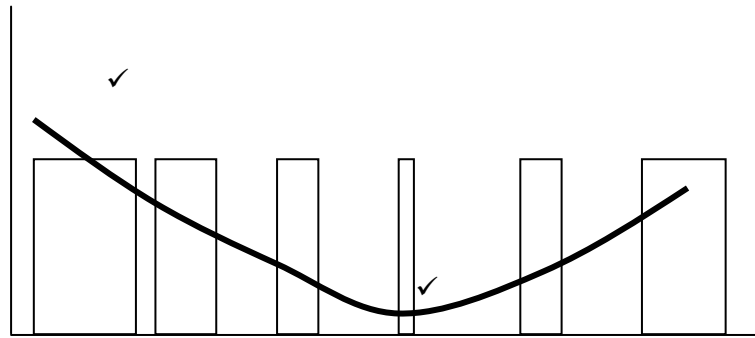
Total 6 marks

3 (a)



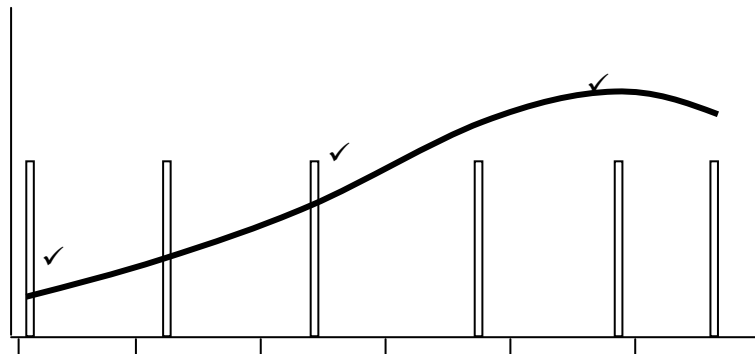
(2 marks)

(b)



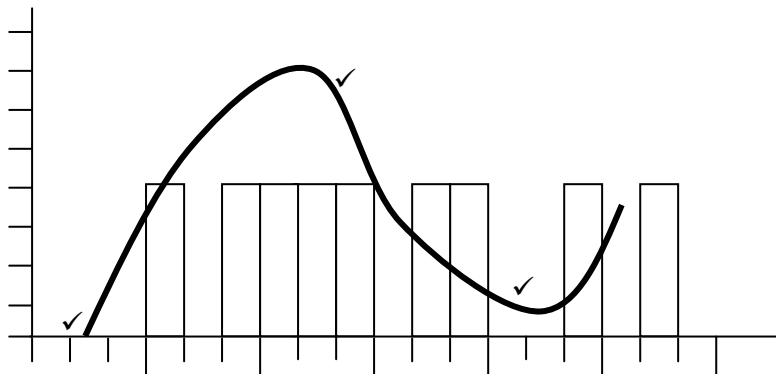
(2 marks)

(c)



(3 marks)

(d)



(3 marks)

Total 10 marks

4 (a)

A	B	S	Q
0	0	0	0
1	0	0	0
0	1	0	1
1	1	0	1
0	0	1	0
1	0	1	1
0	1	1	0
1	1	1	1

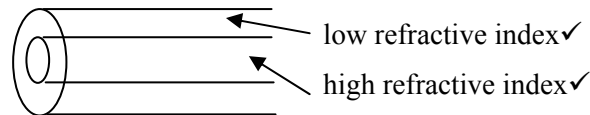
✓✓✓✓ – 1 per error to a mark of 0

(4 marks)

- (b) (i) $A \cdot S$ ✓
 (ii) $B \cdot \bar{S}$ ✓
 (iii) $A \cdot S +$ ✓ $B \cdot \bar{S}$ ✓ (4 marks)

Total 8 marks

5 (a)



(2 marks)

- (b) (i) total internal reflection ✓
 (ii) laser diode (allow LED) ✓
 (ii) photodiode (allow phototransistor) ✓ (4 marks)

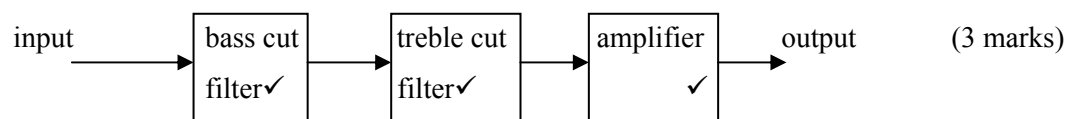
- (c) (i) makes signal weaker ✓
 (ii) spreads signal out in time ✓ (2 marks)

- (d) any one from: security, bandwidth, freedom from E/M interference, link distance etc ✓ relevant explanation ✓ (2 marks)

Total 10 marks

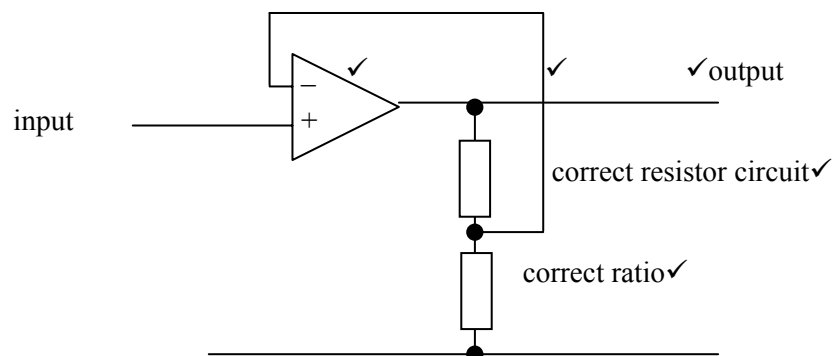
6 (a) $1 \text{ MHz} / 4 \text{ kHz} =$ ✓ 250 ✓ (2 marks)

(b)



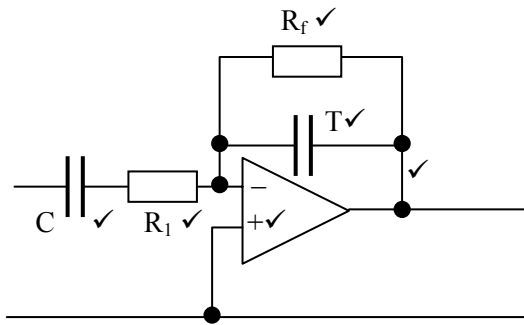
(3 marks)

(c)



(5 marks)

- (d) (i) and (iii)



(ii) $C = 1 / 2 \pi f_0 R$
 $= 1 / 2 \pi \times 300 \times 10^4$
 $= 53 \text{ nF or } 5.3 \times 10^{-8} \text{ F}$

(8 marks)

Total 18 marks

- 7 (a) radio waves ✓ (1 mark)

- (b) (i) time division ✓

(ii) $16 \times 8 =$ ✓ 128 users ✓

(iii) $200 / 8 =$ ✓ 25 kHz ✓

(5 marks)

- (c) responding to signal voltage levels ✓
 in such a way as to lessen the effect of noise ✓
 schmitt trigger sub –system ✓
 has two threshold levels ✓

(4 marks)

Total 10 marks