



General Certificate of Education

Electronics 5431/6431

ELE5 Communication Systems

Mark Scheme

2007 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.

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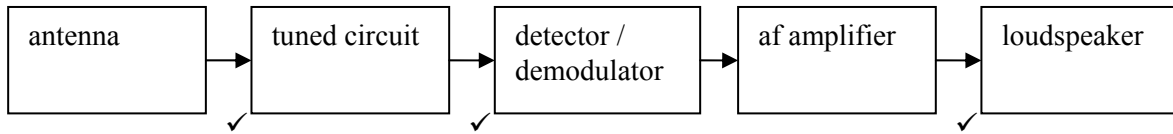
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1 (a)



(marks are for the correct connection of the two adjacent blocks)

(4 marks)

(b) (i) $\lambda = c/f, 3 \times 10^8 / 6 \times 10^5 = \checkmark 500\text{m} \checkmark$

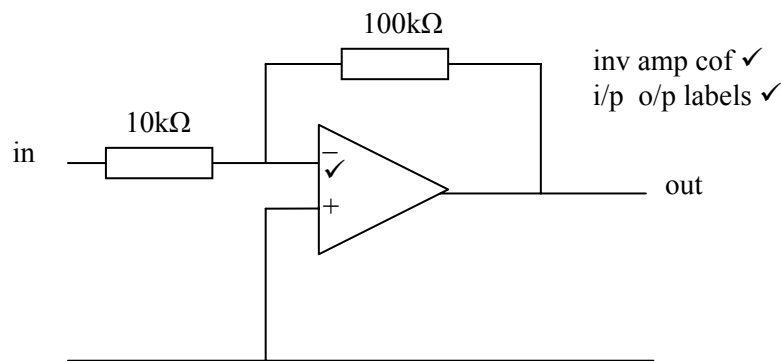
(ii) 250m (or half of above for ecf) \checkmark

(3 marks)

(Total 7 marks)

2 (a) (i) $R_F = 10 \times R_{in} = 100\text{k}\Omega \checkmark$

(ii)



(4 marks)

(b) (i) current/power \checkmark

(ii) input \checkmark
 output \checkmark
 correct MOSFET symbol \checkmark
 n at top for positive half wave, p at bottom \checkmark
 brassing attempt \checkmark correct biasing \checkmark

(iii) a heatsink \checkmark

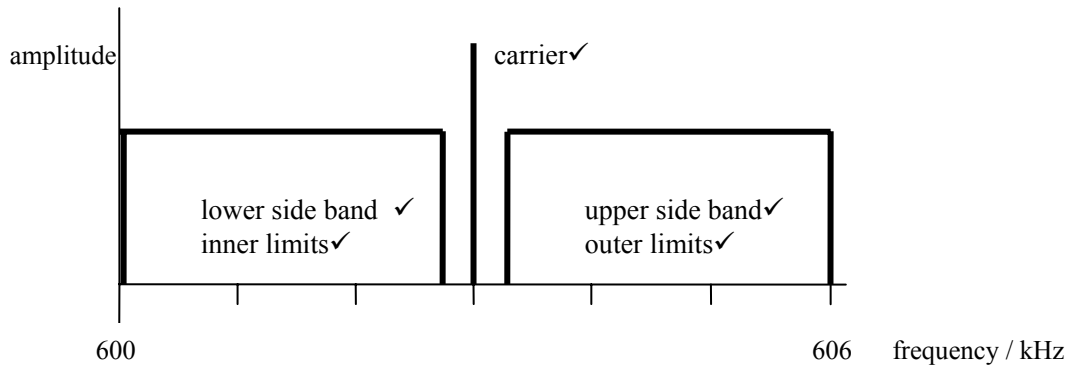
(8 marks)

(Total 12 marks)

3 (a) medium waveband ✓

(1 mark)

(b)



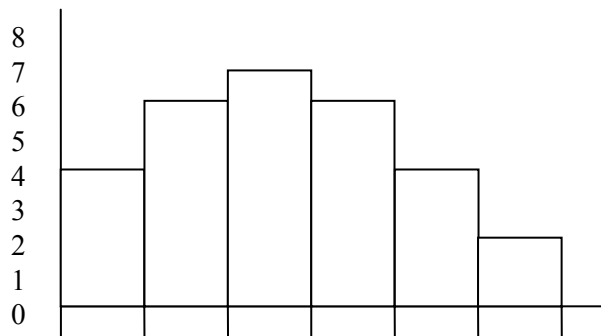
(5 marks)

(c) 6000Hz ✓

(1 mark)

(Total 7 marks)

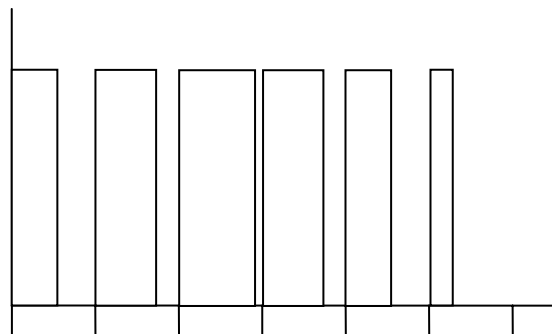
4 (a) PAM signal



✓✓

(2 marks)

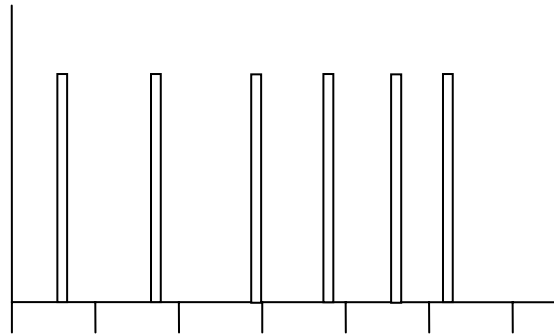
(b) PWM signal



✓✓

(2 marks)

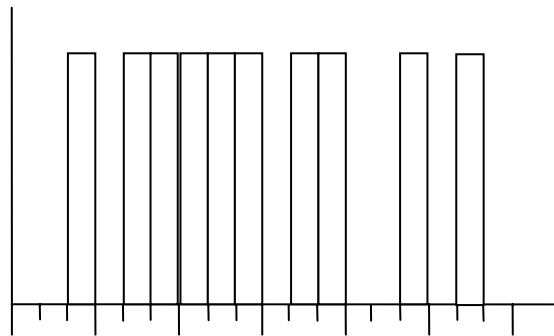
(c) PPM signal



✓✓✓

(3 marks)

(d) 3-bit PCM signal



✓✓✓

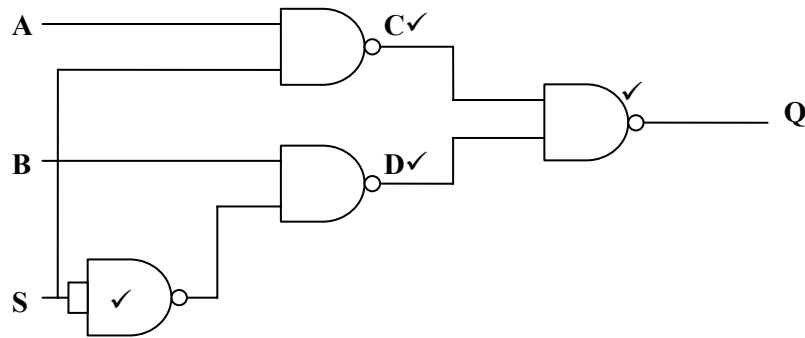
(3 marks)

(Total 10 marks)

- 5 (a) (i) $A.S$ ✓
 (ii) $B.\overline{S}$ ✓
 (iii) $A.S + \overline{B.S}$ ✓

(4 marks)

(b)



(4 marks)

(c) one IC rather than 3/size/cost/reliability/power consumption (any two) ✓✓

(2 marks)

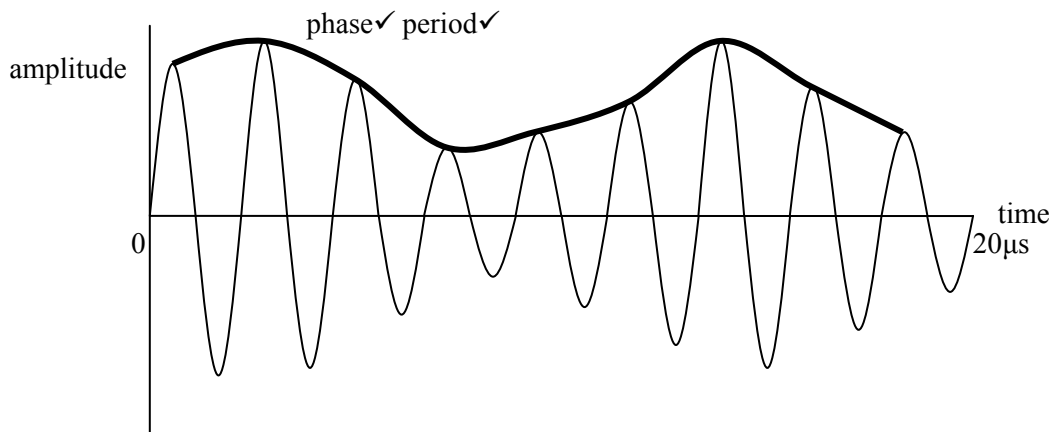
(Total 10 marks)

6

(a) $20 / 9 = 2.2\mu\text{s}$ ✓
 $1 / 2.2 \times 10^{-6}$ ✓ 450 kHz ✓

(3 marks)

(b)



(2 marks)

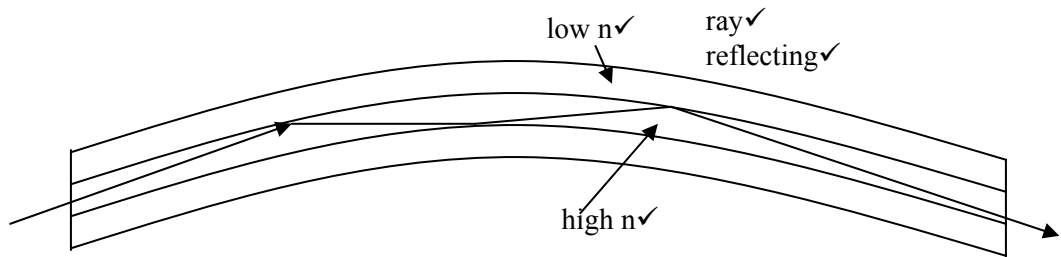
(c) (i) use of $f = 1 / 2\pi \sqrt{LC}$ ✓ 1592 kHz ✓

(ii) $1592 + 455$ or $1592 - 455$ ✓

(3 marks)

(Total 8 marks)

7 (a)

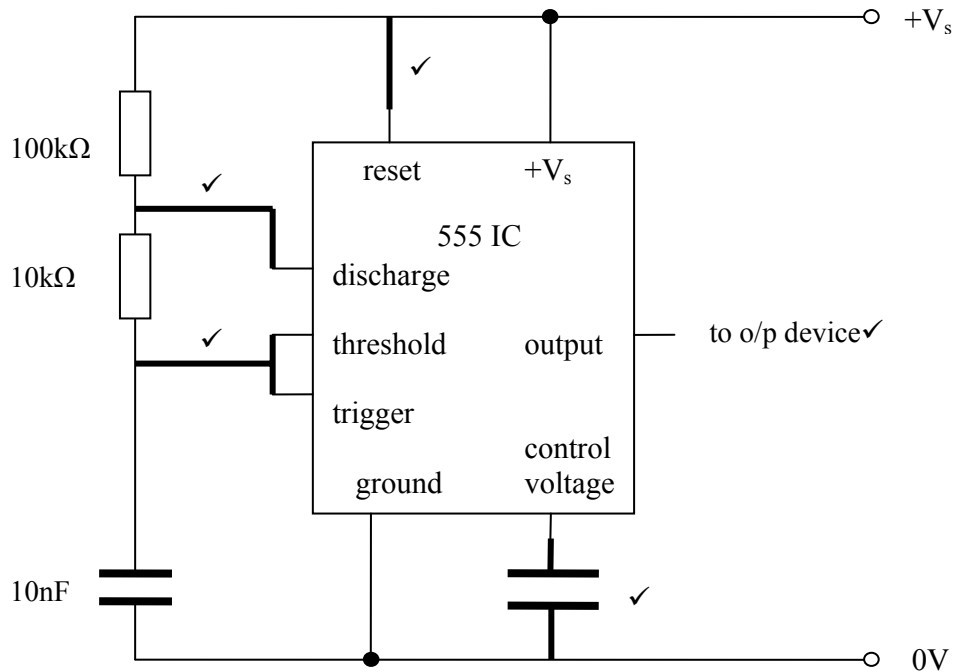


(4 marks)

(b) laser diode/LED

(1 mark)

(c) (i)



(ii) use of $f = 1.44 / (R_A + 2R_B)$ 1200Hz

(iii) 0.7×10^{-4} s

(8 marks)

(d) (i) radio waves

(ii) explanation using:
 cells
 frequency re-use
 channels
 time division multiplex

(5 marks)

(Total 18 marks)