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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Electronics 5431/6431

ELE1 Foundation Electronics

Mark Scheme

2007 examination - June series

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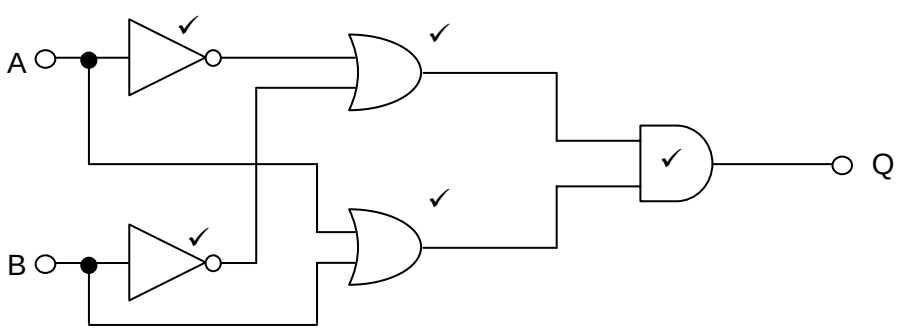
Dr Michael Cresswell Director General

1 (a)

A	**B**	**A**	$\overline{\mathbf{B}}$	$\overline{\mathbf{A}}$ **+ B**	$\overline{\mathbf{A}}$ **+** $\overline{\mathbf{B}}$	**Q**
0	0	1	1	1	0	0
0	1	1	0	1	1	1
1	0	0	1	1	1	1
1	1	0	0	0	1	0
		✓	✓	✓	✓	✓

(5 marks)

(b)



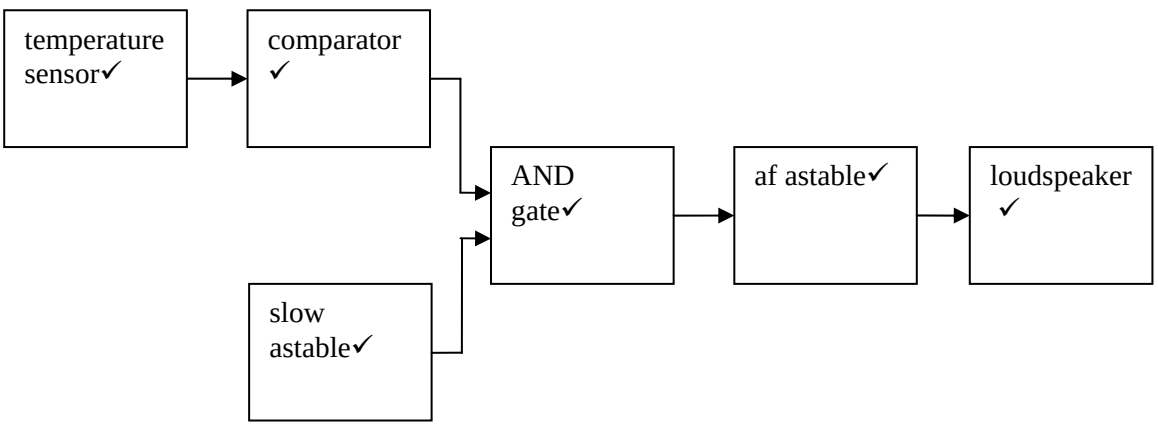
(5 marks)

(c) EXOR ✓

(1 mark)

(Total 11 marks)

2 (a)



(6 marks)

(b) (i) comparator✓

(ii) temperature sensor✓

(iii) AND gate✓

(3 marks)

(Total 9 marks)

3 (a) (i) $1 \div 68 + 1 \div 68$, or $(68 \times 68) \div (68 + 68) = 34\mu F$✓✓

(ii) $34 \times 10^{-6} \times 150 \times 10^{3} = 5.1s$✓✓

(4 marks)

(b) (i) $T = 0.69RC$, $0.69 \times 5.1 = 3.5s$✓✓

(ii) $5RC = 5 \times 5.1 = 25.5s$✓

(3 marks)

(Total 7 marks)

4 (a) (i) 100°C✓

(ii) the thermistor has its minimum resistance at this temp. ✓

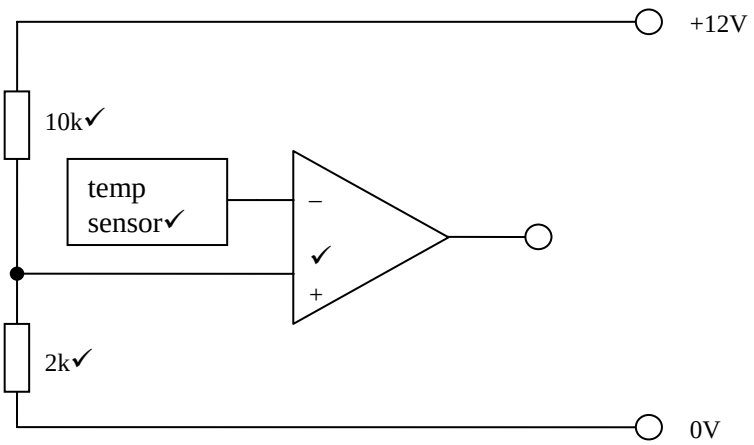
(iii) tot res = 10k + 2k = 12k✓ $I = V \div R$, $12V \div 12k = 1mA$✓

(iv) $Vo = (2 \div (10 + 2)) \times 12V = 2V$✓

(5 marks)

(b) (i) 2V✓

(ii)

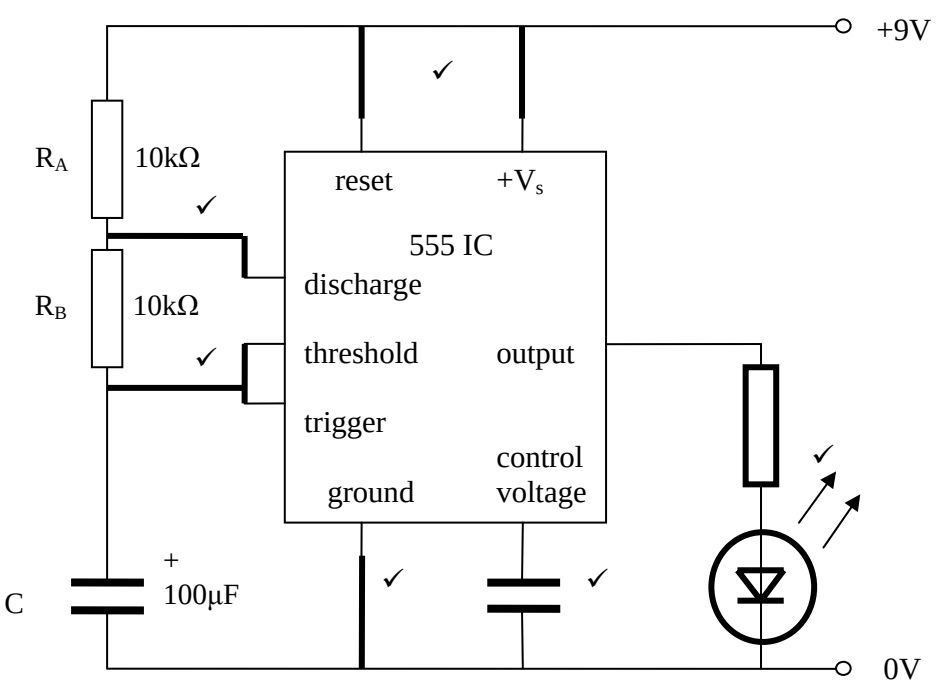


(5 marks)

(Total 10 marks)

5 (a) (i)

(ii)



(6 marks)

(b) (i) $t_h = 0.7 \times 2 \times 10^4 \times 10^{-4} =$✓ 1.4s✓

(ii) $t_l = 0.7 \times 10^4 \times 10^{-4} =$✓ 0.7s✓

(iii) $f = 1.44 \div (3 \times 10^4 \times 10^{-4}) =$ ✓ 0.5Hz✓

(6 marks)

(Total 12 marks)

6 (a) a comparator or logic gate can not switch the level of output current✓

(1 mark)

(b) (i) bipolar transistor✓, MOSFET✓ (any order)
allow thymistor and triac

(ii) electromagnetic relay✓

(iii) diode✓

(4 marks)

(Total 5 marks)

7 (a) (i) zener✓ diode✓

(ii) 5.1V✓

(iii) reverse✓

(4 marks)

(b) (i) 50 + 5 = 55mA✓

(ii) 7 – 5.1 = 1.9V✓

(iii) 1.9 ÷ 0.055✓ = 34.5Ω✓

(iv) 33Ω✓

(5 marks)

(c) (i) 9.6 – 5.1 = 4.5V✓

(ii) 4.5 ÷ 33✓ = 0.136A✓

(iii) 0.136 × 4.5 = 0.6W✓

(4 marks)

(d) (i) 0.136A✓

(ii) 5.1 × 0.136 = 0.7W✓

(2 marks)

(e) (i) $5.1 \times 0.05 = 0.255W$✓

(ii) efficiency is low✓
wasteful use of energy stored in small 9V battery✓

(3 marks)

(Total 18 marks)