



General Certificate of Education

Electronics 5431/6431

ELE1 Foundation Electronics

Mark Scheme

2007 examination - June series

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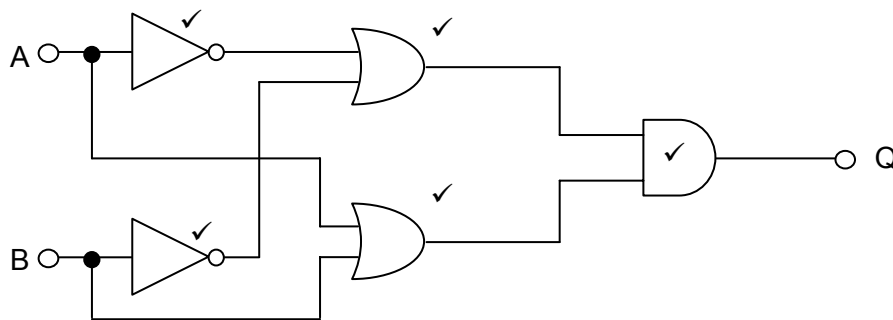
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1 (a)

A	B	A	\bar{B}	$\bar{A} + B$	$\bar{A} + \bar{B}$	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)



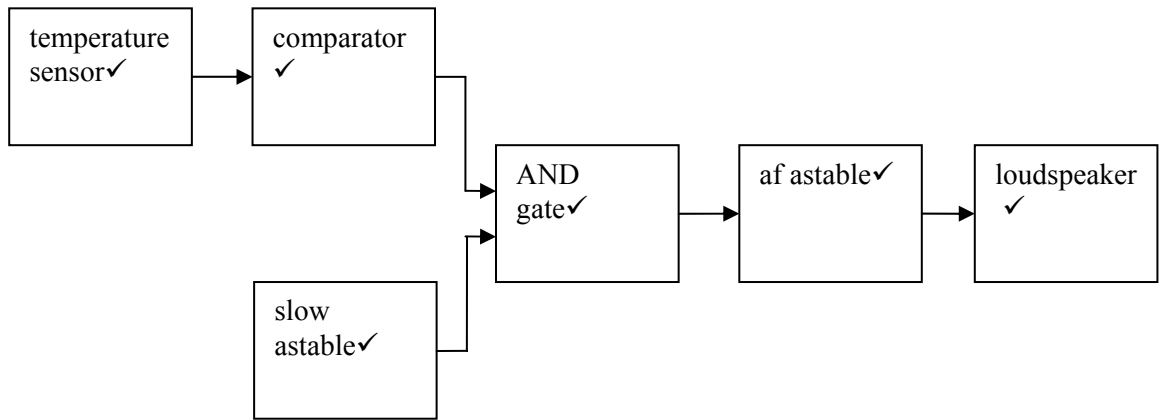
(5 marks)

(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 $(68 \times 68) \div (68 + 68) = 34 \mu\text{F}$ ✓ ✓
 (ii) $34 \times 10^{-6} \times 150 \times 10^3 = 5.1\text{s}$ ✓ ✓

(4 marks)

- (b) (i) $T = 0.69RC$, $0.69 \times 5.1 = 3.5\text{s}$ ✓ ✓
 (ii) $5RC = 5 \times 5.1 = 25.5\text{s}$ ✓

(3 marks)

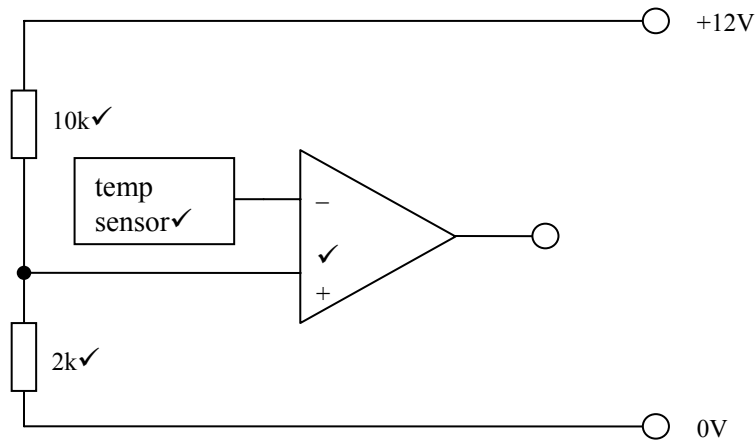
(Total 7 marks)

- 4 (a) (i) 100°C ✓
 (ii) the thermistor has its minimum resistance at this temp. ✓
 (iii) tot res = $10\text{k} + 2\text{k} = 12\text{k}$ ✓ $I = V \div R$, $12\text{V} \div 12\text{k} = 1\text{mA}$ ✓
 (iv) $V_o = (2 \div (10 + 2)) \times 12\text{V} = 2\text{V}$ ✓

(5 marks)

(b) (i) 2V✓

(ii)

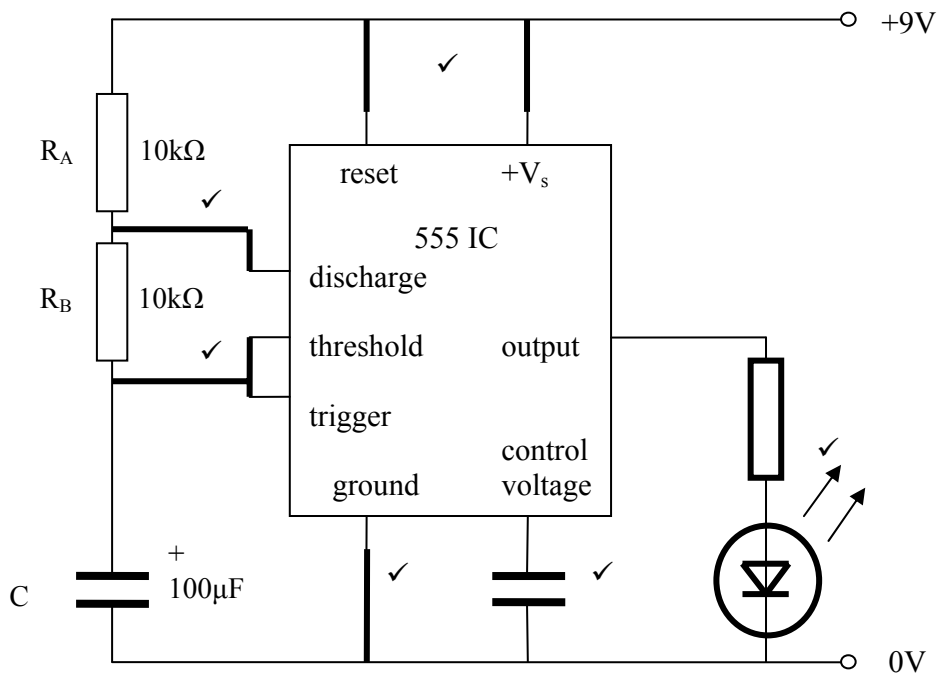


(5 marks)

(Total 10 marks)

5 (a) (i)

(ii)



(6 marks)

- (b) (i) $t_h = 0.7 \times 2 \times 10^4 \times 10^{-4} = \checkmark \quad 1.4s\checkmark$
(ii) $t_f = 0.7 \times 10^4 \times 10^{-4} = \checkmark \quad 0.7s\checkmark$
(iii) $f = 1.44 \div (3 \times 10^4 \times 10^{-4}) = \checkmark \quad 0.5Hz\checkmark$

(6 marks)

(Total 12 marks)

- 6** (a) a comparator or logic gate can not switch the level of output current \checkmark

(1 mark)

- (b) (i) bipolar transistor \checkmark , MOSFET \checkmark (any order)
allow thymistor and triac
(ii) electromagnetic relay \checkmark
(iii) diode \checkmark

(4 marks)

(Total 5 marks)

- 7** (a) (i) zener \checkmark diode \checkmark
(ii) 5.1V \checkmark
(iii) reverse \checkmark

(4 marks)

- (b) (i) $50 + 5 = 55mA\checkmark$
(ii) $7 - 5.1 = 1.9V\checkmark$
(iii) $1.9 \div 0.055\checkmark = 34.5\Omega\checkmark$
(iv) $33\Omega\checkmark$

(5 marks)

- (c) (i) $9.6 - 5.1 = 4.5V\checkmark$
(ii) $4.5 \div 33\checkmark = 0.136A\checkmark$
(iii) $0.136 \times 4.5 = 0.6W\checkmark$

(4 marks)

- (d) (i) $0.136A\checkmark$
(ii) $5.1 \times 0.136 = 0.7W\checkmark$

(2 marks)

- (e) (i) $5.1 \times 0.05 = 0.255\text{W}$ ✓
(ii) efficiency is low✓
wasteful use of energy stored in small 9V battery✓

(3 marks)

(Total 18 marks)