



# **General Certificate of Education June 2010**

**ELECTRONICS**

**ELEC1**

**Unit 1      Introductory Electronics**

<b><i>Mark Scheme</i></b>
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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.

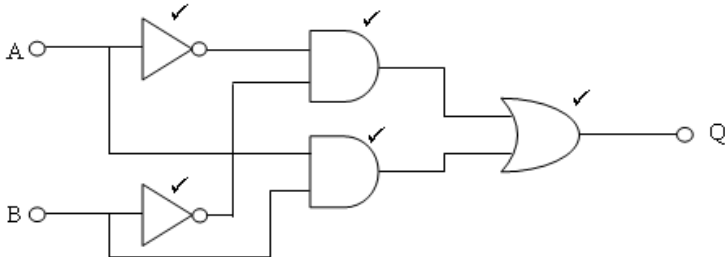
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1	(a)	<table><tr><td>A</td><td>B</td><td><math>\bar{A}</math></td><td><math>\bar{B}</math></td><td><math>A \cdot B</math></td><td><math>\bar{A} \cdot \bar{B}</math></td><td>Q</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr></table> <div>✓   ✓   ✓   ✓   ✓</div>	A	B	$\bar{A}$	$\bar{B}$	$A \cdot B$	$\bar{A} \cdot \bar{B}$	Q	0	0	1	1	0	1	1	0	1	1	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	1	0	1	5
	A	B	$\bar{A}$	$\bar{B}$	$A \cdot B$	$\bar{A} \cdot \bar{B}$	Q																															
0	0	1	1	0	1	1																																
0	1	1	0	0	0	0																																
1	0	0	1	0	0	0																																
1	1	0	0	1	0	1																																
(b)		5																																				
(c)	EXNOR ✓	1																																				

Total Mark: 11

2	(a)	<pre>graph LR     temp[temp sensor] --&gt; comp1[comparator]     hum[humidity sensor] --&gt; comp2[comparator]     s1[set level] --&gt; comp1     s2[set level] --&gt; comp2     comp1 --&gt; and[AND gate]     comp2 --&gt; and     and --&gt; driver[driver]     driver --&gt; motor[motor]</pre> <p>max 7 marks</p>	7	
	(b)	(i)	driver✓	1
	(b)	(ii)	comparator✓	1
	(b)	(iii)	temperature sensor✓	1
	(c)	(i)	25 + 450 = 475mA✓	1
	(c)	(ii)	12V × 475mA✓ = 5.7W✓	2

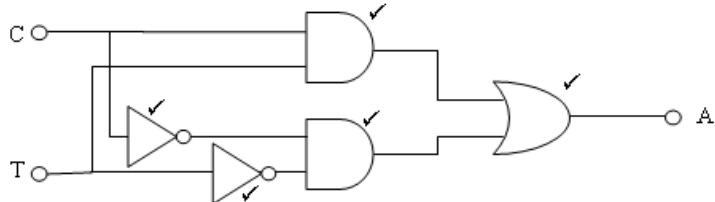
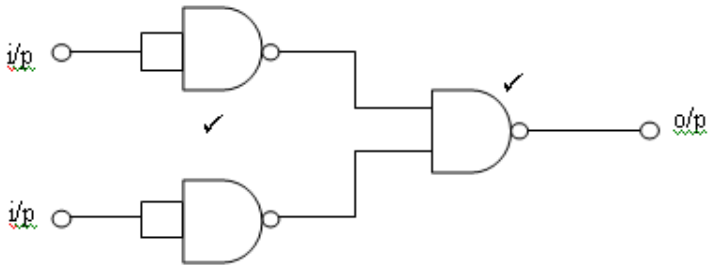
Total Mark: 13

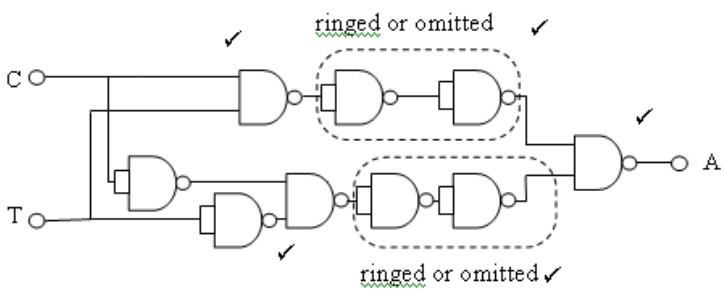
<b>3</b>	(a)	(i)	$9 - 1.7 = 7.3\text{V}$ ✓	<b>1</b>
	(a)	(ii)	$7.3 \div 0.02 = 365\Omega$ ✓	<b>2</b>
	(a)	(iii)	$390\Omega$ ✓	<b>1</b>
	(a)	(iv)	$7.3 \div 390 = 18.7\text{ mA}$ ✓	<b>2</b>
	(a)	(v)	$30 + (5 \times 18.7) = 123.5\text{ mA}$ ✓	<b>1</b>
	(a)	(vi)	not suitable, it will quickly become discharged✓	<b>1</b>
	(b)	(i)	$18.7 \div 3 = 6.2\text{ mA}$ ✓	<b>1</b>
	(b)	(ii)	brightness reduces the more LEDs that are on✓ not suitable, should be the same brightness regardless✓	<b>2</b>

**Total Mark: 11**

<b>4</b>	(a)		MOSFET symbol✓ drain label✓ source label✓ gate label✓	<b>4</b>
	(b)		diode across coil✓ diode orientation✓	<b>2</b>
	(c)		normally closed✓ common✓ normally open✓	<b>3</b>

**Total Mark: 9**

<b>5</b>	(a)		$A = C.T + \overline{C.T}$ ✓	<b>3</b>
	(b)			<b>5</b>
	(c)			<b>2</b>

5	(d)		5
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**Total Mark: 15**

6	(a)	Choice of 20kΩ✓ pot div calculation✓ 8V✓	3
	(b)	upper half the value of lower✓ in range 1kΩ to 10kΩ✓ preferred values 1kΩ and 2kΩ, or 1.8kΩ and 3.6kΩ etc✓	3
	(c)	(i) +12V or high✓	1
	(c)	(ii) 0V or low✓	1

**Total Mark: 8**