

QUESTION 4.



5 (a)	<table><tr><th>A</th><th>B</th><th>X</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	X	0	0	1	0	1	1	1	0	1	1	1	0	1									
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(b) (i)	<table><tr><th>S</th><th>R</th><th>Q</th><th>$\overline{Q}$</th></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr></table>	S	R	Q	$\overline{Q}$	1	0	0	1	1	1	0	1	0	1	1	0	1	1	1	0	0	0	1	1	1 1 1 1
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(ii)	S = 0 R = 0 Produces $Q = 1$, $\overline{Q} = 1$ // Q and $\overline{Q}$ have same value But Q and $\overline{Q}$ should be complements of each other Becomes unstable	1 1 1 1 Max 3																								
(c) (i)	Clock (pulse)	1																								
(ii)	All four possibilities are valid The 1-1 combination changes output to logical complement Unstable state avoided Invalid state cannot occur // the flip-flop is stable	1 1 1 1 Max 1																								
(d)	Memory // data storage Stores a single bit	1 1																								
6 (a) (i)	Monitoring systems	1																								

QUESTION 5.



Question	Answer			Marks
5(a)(i)	A	B	X	1
	0	0	1	
	0	1	1	
	1	0	1	
	1	1	0	



Question	Answer																																																																																		
5(a)(ii)	<table><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>						A	B	C	X	0	0	0	1	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1	1	1	1	0	1	1	1	1	0																																									
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Question	Answer
5(d)	• A flip-flop can store either a 0 or a 1 • Computers use bits to store data • Flip-flops can therefore be used to store bits (of data) • Memory can be created from flip-flops 1 mark for valid point, max 2

QUESTION 6.



Question	Answer	
6(a)	One mark for suitable sensor, one mark for justification Max one sensor, max two marks humidity ... to ensure that the plants have the right level of moisture in the air pressure / proximity ... to detect whether the windows are open or closed condone '<i>check</i>' moisture ... to ensure the water levels in the soil are correct light ... to ensure the light levels in the greenhouse are correct for plant growth ... to ensure the windows are closed when night falls Accept pH sensor for one mark only Accept CO₂ sensor for one mark only, accept gas or O₂ for one mark only Justification needs to answer the question why? Not just describe the sensor Accept suitable actions resulting from sensor readings as justification	
6(b)	Three from: • Actions taken by system // or by example: e.g. adjust heater / turn on sprinkler / open windows • May affect the readings taken by the sensors // or by example • Which in turn may cause a change in the actions taken by the system // or by example • This is a continuous process...	3
6(c)(i)	One from: • Lowest allowable temperature • Highest allowable temperature • Sampling time interval	1



Question	Answer	
6(c)(ii)	If answer to c(i) is highest allowable or lowest allowable temperature: - The sensor reading is compared to a stored parameter (1) - Depending upon result of comparison an action may or may not be carried out (1) If answer to c(i) is sampling time interval: - The higher the sampling rate... (1) ...The better / more efficient is the control system (1)	
6(d)(i)	20	1
6(d)(ii)	<pre>LDD 4002 // load the contents of the 16 bit location containing the value for Sensor 5 into the Accumulator LSR #8 // move the bits in the Accumulator so that the Accumulator stores the value of Sensor 5 as unsigned 16-bit binary integer</pre> 1 mark for 4002 1 mark for LSR 1 mark for #8	3

QUESTION 7.



Question	Answer			Marks
5(a)(i)	A	B	X	1
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