

GCSE

Design and Technology

General Certificate of Secondary Education **1953/04**

Electronic Products Paper 4 (Higher Tier)

Mark Scheme for June 2010

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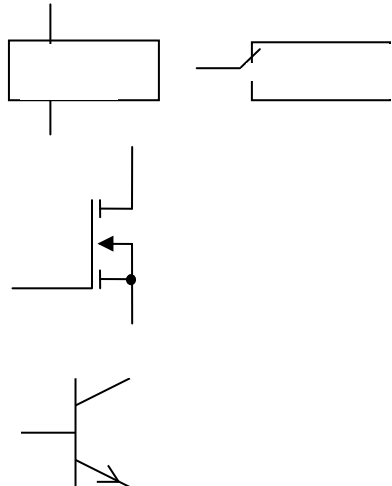
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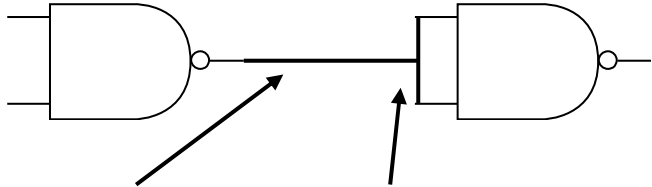
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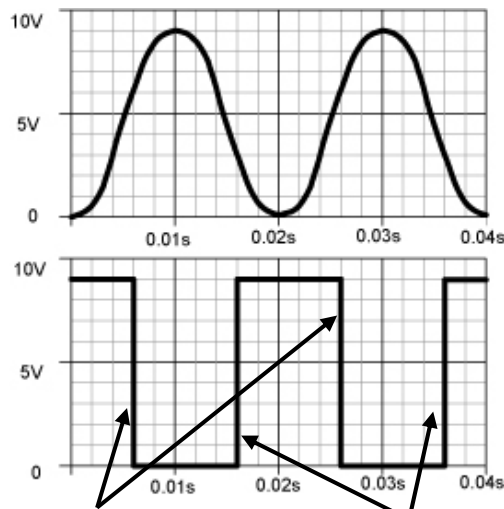
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Question			Syllabus Ref	Expected Answers	Marks	Additional Guidance								
1	(a)	(i)		<table><tr><th>Product</th><th>Soldering method</th></tr><tr><td>SMT (surface mount technology) PCB boards for mobile phones.</td><td>Hot air jet soldering / plasma soldering / flow soldering</td></tr><tr><td>Prototype PCB board for an egg timer project.</td><td>Hand-held soldering iron</td></tr><tr><td>‘through-hole’ PCB’s for use in DVD video recorders.</td><td>Molten solder bath flow / wave soldering</td></tr></table>	Product	Soldering method	SMT (surface mount technology) PCB boards for mobile phones.	Hot air jet soldering / plasma soldering / flow soldering	Prototype PCB board for an egg timer project.	Hand-held soldering iron	‘through-hole’ PCB’s for use in DVD video recorders.	Molten solder bath flow / wave soldering	[1]	
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	[1]													
	[1]													
		(ii)		1. electrocution 2. burns.	[1] [1]	Do not allow responses relating to fumes or lead or solder spitting.								
	(b)	(i)		Lead is toxic to plant and animal life / lead is an accumulative poison.	[1]	Allow “poisonous”								
		(ii)		1. Using lead free solder 2. Recycling / controlled disposal of lead	[1] [1]	Do not accept just ‘don’t use lead’								
	(c)			Dirt present / poor application of heat / soldering iron too cool / lack of flux / corrosion or oxide present / moving the component before solder has frozen. 1 mark for each correct response.	[2]									
				Total	[10]									

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2	(a)	(i)		<table><tr><th>Type</th><th>Description</th><th>System</th></tr><tr><td>1</td><td>Uses radar, flash guns and a camera to photograph the back of speeding cars as they pass.</td><td>Gatso</td></tr><tr><td>2</td><td>Uses piezo or magnetic sensors in the road and photographs approaching cars as they pass over road markings.</td><td>Truvelo</td></tr><tr><td>3</td><td>Uses number plate scanning to identify a vehicle and calculate its average speed over a set journey.</td><td>Specs/SVDD</td></tr><tr><td>4</td><td>Is portable, accurate and has a longer operating range than similar wireless radar based system.</td><td>Laser gun</td></tr></table>	Type	Description	System	1	Uses radar, flash guns and a camera to photograph the back of speeding cars as they pass.	Gatso	2	Uses piezo or magnetic sensors in the road and photographs approaching cars as they pass over road markings.	Truvelo	3	Uses number plate scanning to identify a vehicle and calculate its average speed over a set journey.	Specs/SVDD	4	Is portable, accurate and has a longer operating range than similar wireless radar based system.	Laser gun	[4]	
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		4	Is portable, accurate and has a longer operating range than similar wireless radar based system.	Laser gun																	
(ii)	Use of infra-red lighting.	[1]																			
(iii)	Motorists have less time to slow down before the reading is taken.	[1]																			
(b)	(i)	Motorists are made aware that they are speeding / no need to take your eyes off the road to check speed.	[1]																		
	(ii)	Solar power. Wind power.	[1] [1]																		
	(iii)	Download latest software updates.	[1]																		
				Total	[10]																

Question			Syllabus Ref	Expected Answers	Marks	Additional Guidance
3	(a)	(i)		Monostable	[1]	
		(ii)		1.1*100,000*0.00022 or 1.1*100K*220μF (correct substitution) 1 mark. 24.2s 1 mark. Correct answer without working 2 marks.	[2]	
	(b)	(i)		Allows use of higher voltages / allows use of a.c. / amplifies current. 1 mark each, up to a maximum of 2 marks.	[2]	
		(ii)		 <div>SPDT relay</div> <div>FET</div> <div>NPN transistor</div>	<div>[1]</div> <div>[1]</div> <div>[1]</div>	<div>Accept just relay</div> <div>Accept just transistor. Do not accept PNP transistor.</div>
		(iii)		Addition of a protection diode. Accept just 'use a diode'.	[1]	
		(iv)		Requires less current to switch it on.	[1]	
Total					[10]	

Question			Syllabus Ref	Expected Answers	Marks	Additional Guidance
4	(a)	(i)		1. Operate over a wider voltage range i.e. 3V-15V. 2. Use less power / current.	[1] [1]	Must relate to the power supply requirements.
		(ii)		The number of gate inputs that can be driven from one output.	[1]	
	(b)	(i)		 <p>Connection from output to second gate</p> <p>Both inputs together to make NOT</p>	[1]	Both connections must be made for the mark.
		(ii)		To eliminate noise / improve quality of switching / to convert an analogue signal to a digital signal.	[1]	

Question			Syllabus Ref	Expected Answers	Marks	Additional Guidance
4	(c)	(i)		<div><p>1 mark for a square wave</p><p>1 mark for correct 6V switch off point</p><p>1 mark for correct 3V switch off point</p></div>		Look carefully at the graph where their response may be indistinct.
		(ii)	Sine wave / a.c. / alternating current	[3]	[1]	
		(iii)	50Hz	[1]	[1]	
Total					[10]	

Question			Syllabus Ref	Expected Answers	Marks	Additional Guidance
5	(a)	(i)		Op amp / operational amplifier / comparator	[1]	
		(ii)		4.5V	[1]	
		(iii)		Light will reduce the resistance of the LDR and turn itself off, 1 mark. After turning off the light will come on again, 1 mark. The circuit will oscillate or will hunt, 2 marks.	[2]	
		(iv)		Photodiodes are predominantly sensitive to IR illumination.	[1]	*IR is a lower frequency of light than visible
		(v)		Photodiodes react much faster than LDR's.	[1]	
	(b)	(i)		CE marks guarantee the safety of the product / product conforms to EU standards.	[1]	
		(ii)		BSI kite mark is a statement about the quality testing or safety testing of the product. Accept just testing.	[1]	The response should relate to testing or checking of the product.
		(iii)		ROHS relates to elimination of hazardous materials, accept examples eg: removing Cadmium, accept 'reduction of hazardous substances	[1]	
		(iv)		WEEE relates to the disposal and recycling of products at the end of their useful life, and the manufacturer's responsibility.	[1]	
				Total	[10]	

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