GCSE

Specimen Papers and Mark Schemes

Edexcel GCSE
Design & Technology: Systems & Control Technology (Electronics/Mechanisms) Full course (1974)

For First Examination

Summer 2003

Edexcel

Success through qualifications

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information please call our Customer Response Centre on 0870 240 9800, or visit our website at www.edexcel.org.uk

Autumn 2000

Publications Code UG 009338

Contents

Centre Number						Paper Reference	Surname
Candidate Number						Candidate Signature	Other Names

For Examiner's use only

For Team Leader's use

1974/2F

Edexcel GCSE

Design and Technology: Systems and Control Technology (Electronics) (Full Course)

Paper 2F

FOUNDATION TIER

Specimen Paper

Time: 1½ hours

N0000

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for the examination

None

Items included with these question papers

None

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your signature, your surname and other names. The paper reference is shown in the top left hand corner.

Attempt ALL questions using the spaces provided in the Question Paper.

Information for Candidates

You may use drawing equipment and coloured pencils.

All measurements are in mm unless otherwise stated.

Advice to Candidates

You are reminded of the importance of clear and orderly presentation in your answers.

Include diagrams where these are helpful.

Turn over

Edexcel
Success through qualifications

Attempt ALL questions in the spaces provided.

Leave blank

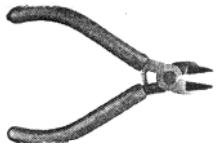
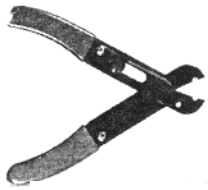
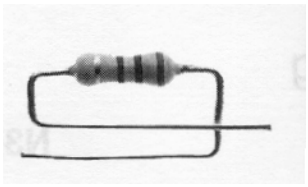
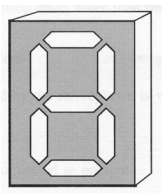
1. The table below shows either some tools or components or equipment.

(a) Complete the table by:

(i) naming each tool or component or equipment;

(ii) describing its use.

The first one has been done for you.

TOOL / COMPONENT / EQUIPMENT	NAME	USE
	Electric soldering iron	Used to permanently fix components into circuits.
		
		
		
		
		

(10)

Leave blank

(b) The soldering iron in the table is used in a school workshop.

(i) Give **one** reason why the bit of the soldering iron is made from copper.

.....

(1)

(ii) Give **two** safety precautions to take when using an electric soldering iron.

1 .....

2 .....

(2)

(c) Explain how a good soldered joint should be produced using an electric soldering iron and multicore solder.

.....

.....

.....

.....

.....

(3)

(d) Before producing large numbers of circuits, manufacturing companies produce a prototype circuit.

(i) Explain what is meant by a *prototype circuit*.

.....

.....

.....

(2)

Turn over

(ii) Describe **two** advantages of using Printed Circuit Boards (PCB) to produce large numbers of identical circuits.

Leave blank

1 .....

.....

2 .....

.....

(4)

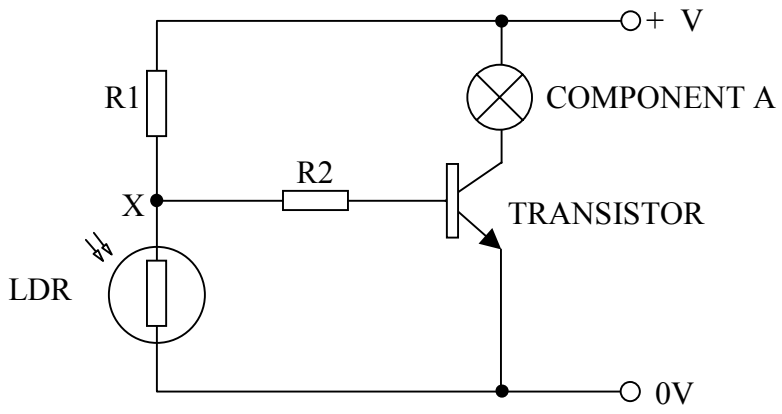
(Total 22 marks)

BLANK PAGE

TURN OVER FOR QUESTION 2

Leave blank

2. (a) A circuit that switches on a light automatically in dark conditions is shown below.

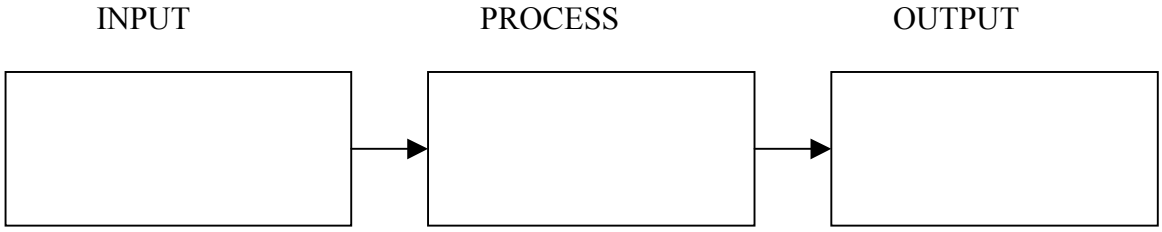


(i) Name the component labelled 'COMPONENT A' in the diagram above.

.....

(1)

(ii) Complete the systems diagram for the circuit.



(3)

(iii) Explain why resistor R2 is needed in the circuit.

.....

.....

.....

(2)

(iv) Explain how a reduction in light level affects the voltage at the point "X".

.....

.....

.....

(3)

(v) Describe how the sensitivity of the circuit could be made adjustable.

Leave blank

.....

.....

(2)

(b) Automatic switching circuits are used in many applications in society.

(i) Give **two** examples of automatic switching circuits.

1 .....

2 .....

(2)

(ii) Describe **two** advantages of automatic switching.

1 .....

.....

2 .....

.....

(4)

(c) Many electronic devices are controlled by programmable microprocessors.

(i) Name **two** programmable products that are used in the home.

1 .....

2 .....

(2)

(ii) Explain how programmable products have affected our lifestyles.

.....

.....

.....

(3)

(Total 22 marks)

Leave blank

3. A company is designing a cheap 'dummy' car alarm. The idea is to make it look as though a car is alarmed when it is locked and unattended.

The specification for the dummy alarm is that:

- it must have two warning LEDs that flash when in operation;
- it must accommodate a PCB 50mm x 50mm;
- it must have easy access to the battery;
- it must fix securely to the dashboard, but be removable.

(a) In the spaces below, use notes and sketches to show **two** designs of the dummy alarm.

DESIGN IDEA 1

(8)

DESIGN IDEA 2

Leave blank

(8)

Turn over

(b) Three of the specification points are given again below.

Leave blank

Use these headings to evaluate **one** of your design ideas against the initial specification.

1. It must accommodate a PCB 50mm x 50mm .

.....

.....

.....

.....

2. It must have easy access to the battery.

.....

.....

.....

.....

3. It must fix securely to the dashboard, but be removable.

.....

.....

.....

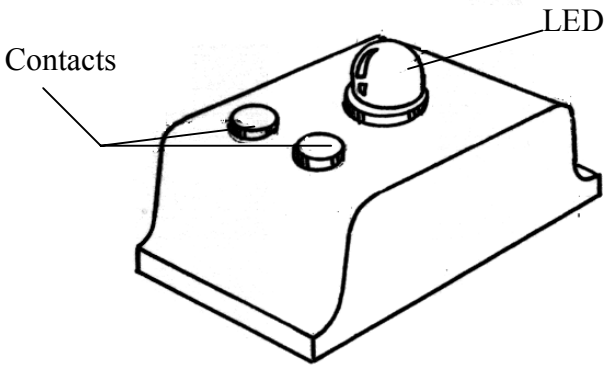
.....

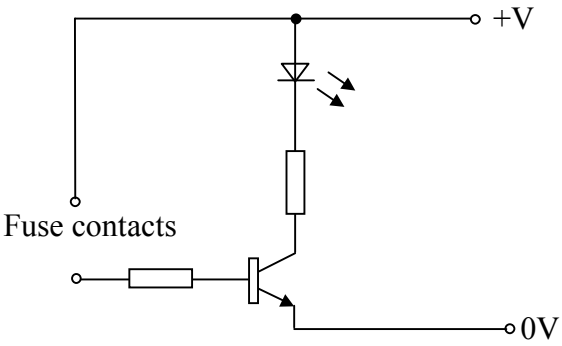
(6)

(Total 22 marks)

Leave blank

4. The diagram below shows the circuit and the case for a simple fuse tester.





ADDITIONAL INFORMATION

The case is made from plastic.
The contacts are made from metal.
The product is aimed at the DIY market.
A fuse is placed across the two metal contacts. The LED lights if the fuse is in good condition.

(a) Two specification points for the fuse tester are:

- its battery must be easily changed;
- the case must be no larger than 80 x 60 x 30.

Give **three** more points that could be included in the specification of the fuse tester. For each point, give a reason why it should be included.

1 .....

Reason .....

2 .....

Reason .....

3 .....

Reason .....

(6)

Turn over

Leave blank

(b) Name the specific type of material suitable for making each of the following parts of the fuse tester:

(i) The body of the case.

.....

(ii) The contacts.

.....

(iii) The bottom of the case.

.....

(3)

(c) Give **one** property associated with **one** of the materials you have named in (b) and explain how this property makes it suitable for this application.

Property .....

Explanation.....

.....

.....

.....

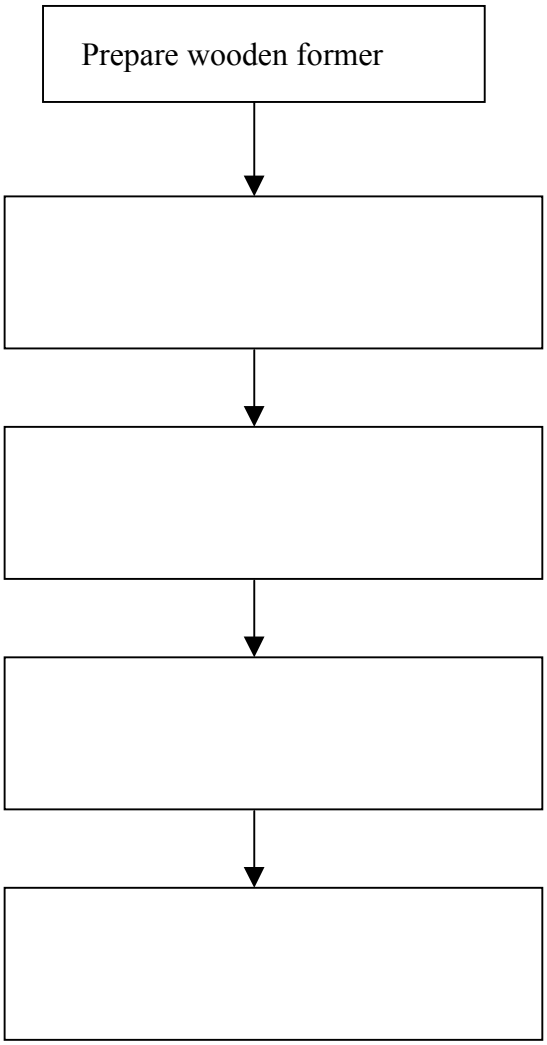
(4)

(d) The body of the case is batch produced using the vacuum forming process.

Complete the diagram below to show the main stages in the vacuum forming process.

The first stage has been done for you.

Leave blank



(5)

Turn over

(e) The purpose of the fuse tester is to test the condition of fuses.

Describe how the electronic circuit shown in the diagram achieves this.

.....

.....

.....

.....

(4)

(Total 22 marks)

Leave blank

PAPER TOTAL 88 MARKS

END

Centre Number						Paper Reference	Surname
Candidate Number						Candidate Signature	Other Names

For Examiner's use only

For Team Leader's use

1974/2H

Edexcel GCSE

Design and Technology: Systems and Control Technology (Electronics) (Full Course)

Paper 2H

HIGHER TIER

Specimen Papers

Time: 1½ hours

N0000

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for the examination

None

Items included with these question papers

None

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your signature, your surname and other names. The paper reference is shown in the top left hand corner.

Attempt ALL questions using the spaces provided in this Question Paper.

Information for Candidates

You may use drawing equipment and coloured pencils.

All measurements are in mm unless otherwise stated.

Advice to Candidates

You are reminded of the importance of clear and orderly presentation in your answers.

Include diagrams where these are helpful.

Turn over

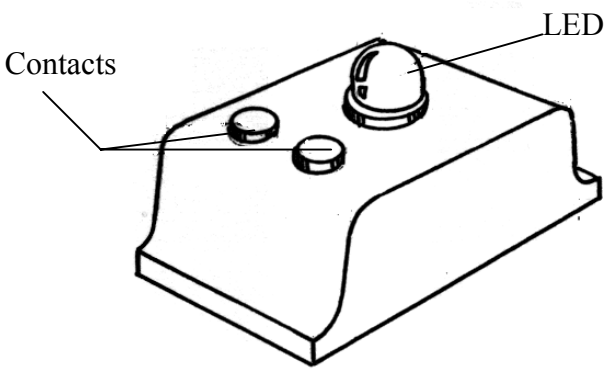
Edexcel
Success through qualifications

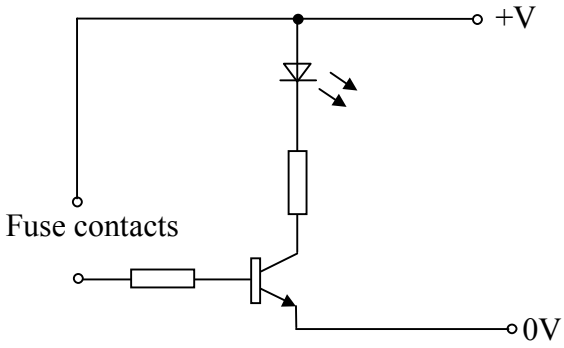
Turn over

Attempt ALL questions in the spaces provided.

Leave blank

1. The diagram below shows the circuit and the case for a simple fuse tester.





ADDITIONAL INFORMATION

The case is made from plastic.
The contacts are made from metal.
The product is aimed at the DIY market.
A fuse is placed across the two metal contacts. The LED lights if the fuse is in good condition.

(a) Two specification points for the fuse tester are:

- its battery must be easily changed;
- the case must be no larger than 80 x 60 x 30.

Give **three** more points that could be included in the specification of the fuse tester. For each point, give a reason why it should be included.

1 .....

Reason .....

2 .....

Reason .....

3 .....

Reason .....

(6)

(b) Name the specific type of material suitable for making each of the following parts of the fuse tester:

Leave blank

(i) The body of the case.

.....

(ii) The contacts.

.....

(ii) The bottom of the case.

.....

(3)

(c) Give **one** property associated with **one** of the materials you have named in (b) and explain how this property makes it suitable for this application.

Property .....

Explanation.....

.....

.....

.....

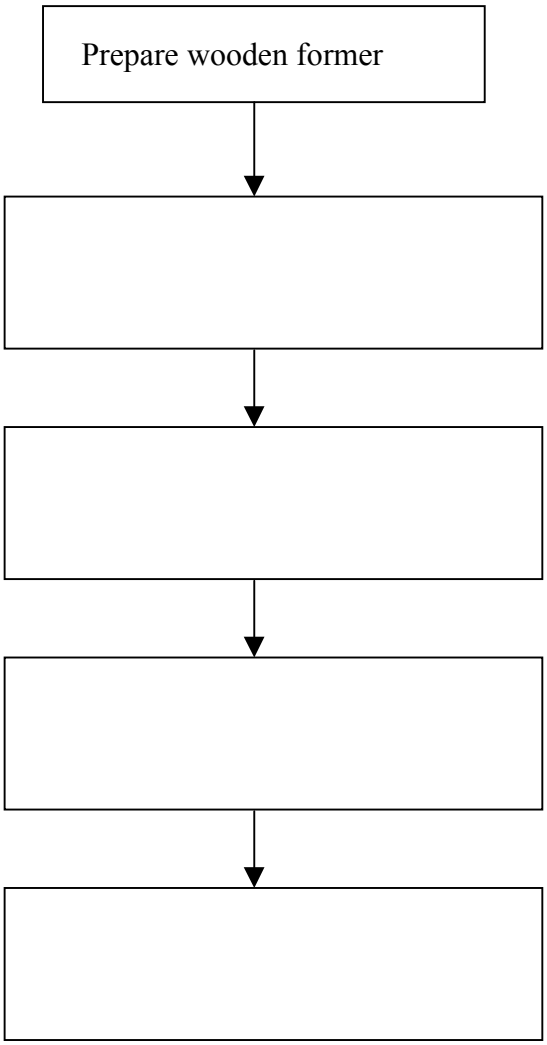
(4)

Leave blank

(d) The body of the case is batch produced using the vacuum forming process.

Complete the diagram below to show the main stages in the vacuum forming process.

The first stage has been done for you.



(5)

(e) The purpose of the fuse tester is to test the condition of fuses.

Describe how the electronic circuit shown in the diagram achieves this.

.....

.....

.....

.....

(4)

(Total 22 marks)

2. The picture below shows a circuit assembly aid.

Leave blank

(a) (i) Give **three** reasons why the assembly aid is useful when soldering components into circuit boards.

1 .....

2 .....

3 .....

(3)

(ii) Give **two** different uses of the assembly aid when assembling PCBs.

1 .....

2 .....

(2)

(b) Give **three** safety precautions to take when handling chemicals used in PCB making.

1 .....

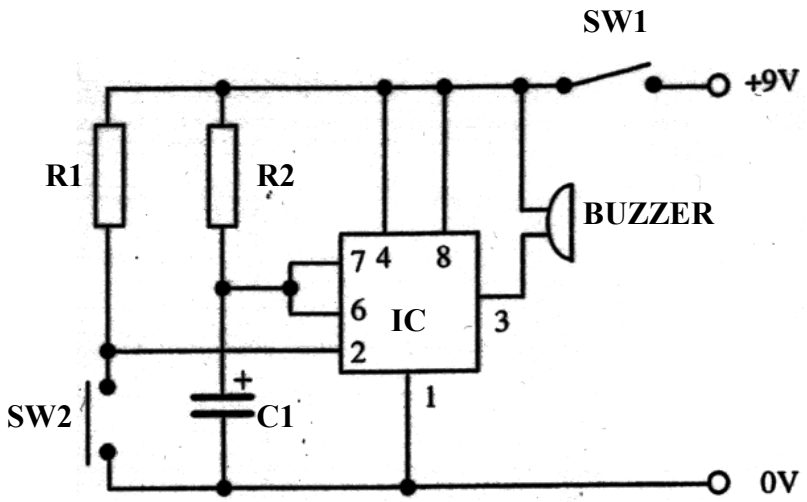
2 .....

3 .....

(3)

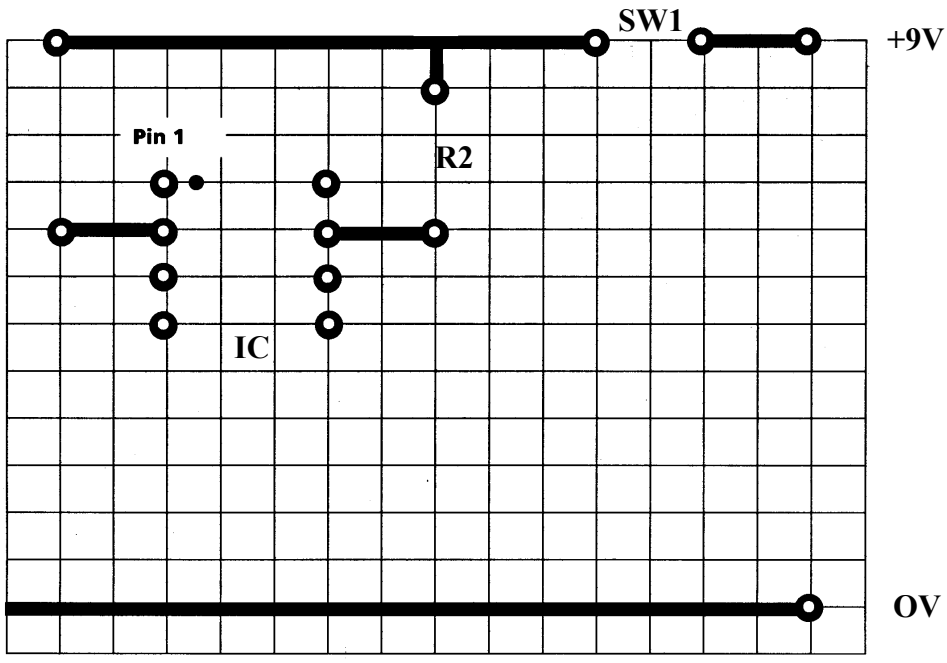
(c) The circuit diagram for a kitchen timer is shown below.

Leave blank



The circuit is to be converted into a PCB layout design.

(i) An incomplete PCB track pattern for the timer, viewed from the component side, is shown below. Complete the PCB track pattern and indicate where the components would be fitted. Some have been done for you.



(12)

(ii) Explain why it is desirable to make the tracks as wide as possible when designing PCB track patterns.

Leave blank

.....

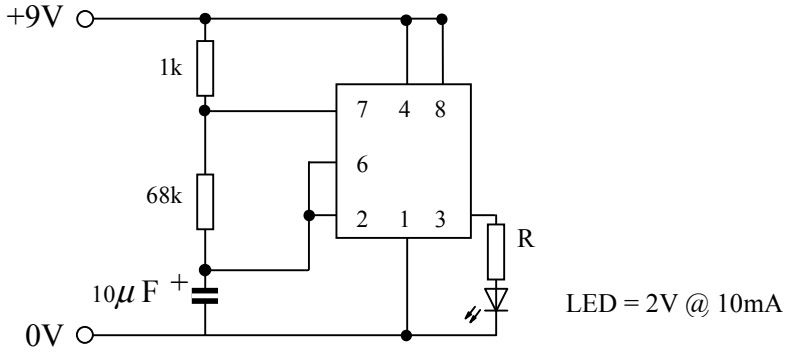
.....

(2)

(Total 22 marks)

Leave blank

3. An astable circuit is shown below with an LED as its output.



(a) (i) State the purpose of resistor R in the circuit.

.....

(1)

(ii) Calculate the value of R so that the LED functions properly.

(3)

(b) The LED must be placed in the circuit the correct way round or it will not light.

Make an annotated sketch of an LED to show **two** methods of identifying the negative leg.

(4)

(c) The astable circuit shown produces an equal mark/space ratio.

Use notes and sketches to explain the term *mark/space ratio*.

Leave blank

(3)

(b) (i) Describe **two** benefits to the consumer of using CAD/CAM in manufacturing electronic products.

1 .....

.....

2 .....

.....

(4)

(ii) Explain how the benefits you have named in (b) (i) are achieved.

.....

.....

.....

.....

.....

(4)

(iii) Give **one** disadvantage brought to society by CAD/CAM production and explain the effect it has on society.

Disadvantage .....

Effect .....

.....

(3)

(Total 22 marks)

Leave blank

4. A company is designing a simple alarm to be used to warn when a bicycle is being moved without permission. It uses a bought-in pre-assembled circuit, powered by a 9V PP3 battery.

The specification for the alarm is that:

- it must fix securely to the frame of the bicycle;
- it must have a warning LED to indicate that the alarm is set;
- there must be easy access to the battery for replacement;
- the case must be weatherproof.

(a) In the spaces below, use notes and sketches to show **two** ideas for the design of the bicycle alarm.

DESIGN IDEA 1

(8)

DESIGN IDEA 2

Leave blank

(8)

Leave blank

(b) Three of the specification points are given again below.

Use these points to evaluate **one** of your designs against the initial specification.

It must fix securely to the frame of the bicycle.

There must be easy access to the battery for replacement.

The case must be weatherproof.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6)

(Total 22 marks)

PAPER TOTAL 88 MARKS

END

Centre Number						Paper Reference	Surname
Candidate Number						Candidate Signature	Other Names

For Examiner's use only

For Team Leader's use

1974/4F

Edexcel GCSE

Design and Technology: Systems and Control Technology (Mechanisms) (Full Course)

Paper 4F

FOUNDATION TIER

Specimen Papers

Time: 1 ½ hours

N0000

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for the examination

None

Items included with these question papers

None

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your signature, your surname and other names. The paper reference is shown in the top left hand corner.

Attempt ALL questions using the spaces provided in the Question Paper.

Information for Candidates

You may use drawing equipment and coloured pencils.

All measurements are in millimetres unless otherwise stated

Advice to Candidates

You are reminded of the importance of clear and orderly presentation in your answers.

Include diagrams where these are helpful.

Turn over

Edexcel
Success through qualifications

Answer ALL questions in the spaces provided.

Leave blank

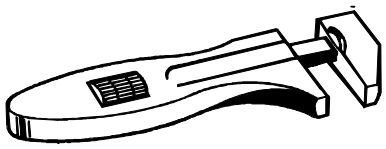
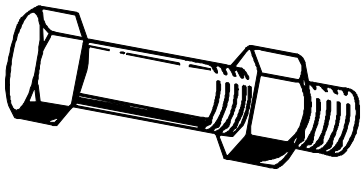
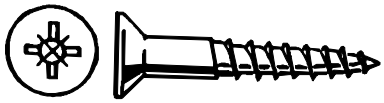
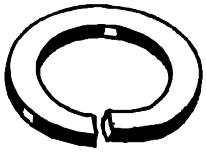
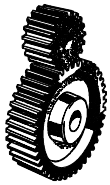
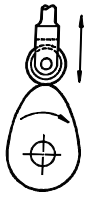
1. The table below shows either some common workshop tools or components or equipment.

(a) Complete the table by:

(i) naming each tool or component or equipment;

(ii) describing its use.

The first one is done for you.

TOOL / COMPONENT / EQUIPMENT	NAME	USE
	Adjustable spanner	Jaws of the spanner are adjusted to fit a range of nut sizes
		
		
		
		
		

(10)

Leave blank

(b) The adjustable spanner shown in the table acts as a lever.

(i) Name the order of lever.

.....

(1)

(ii) Describe how the mechanism of the spanner allows it to be adjusted to fit different size nuts.

.....

.....

.....

(3)

(iii) Explain why it is important to adjust the jaws of the spanner to be a close fit on the nut.

.....

.....

(2)

(c) Nuts are supplied as standard sized components.

Explain what is meant by a *standard sized component*.

.....

.....

(2)

(d) Nuts are called temporary fixing components

(i) Explain what is meant by a *temporary fixing component*.

.....

.....

(2)

(ii) Explain what is meant by a permanent fixing component.

.....

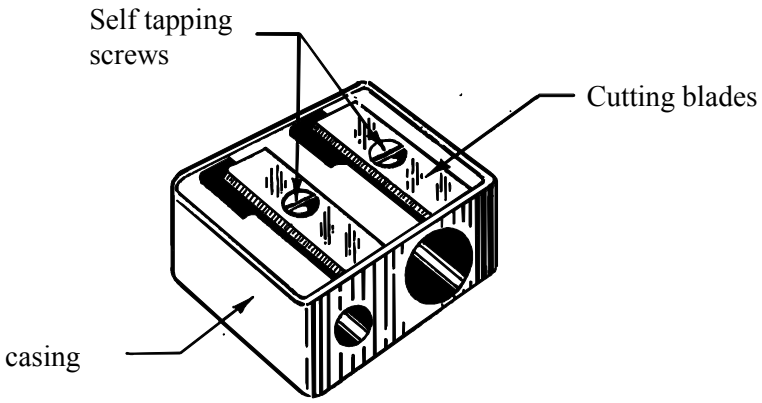
.....

(2)

(Total 22 marks)

Leave blank

2. The diagram below shows a pencil sharpener.



(a) (i) Name **two** suitable materials for the outer casing of the pencil sharpener.

1.....

2.....

(2)

(ii) Name a suitable material for the cutting blades of the pencil sharpener

.....

(1)

(iii) Name a property of the cutting blade that makes it suitable for this application.

.....

(1)

(b) The blade of the pencil sharpener is held in place by a self-tapping screw similar to the one shown below.

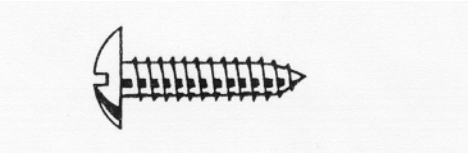
Leave blank

(i) Show on the drawing below the following:

1.The root diameter

2.The crest diameter

3.The pitch



(3)

(ii) Give **two** advantages for using self-tapping screws in the production process.

1 .....

2 .....

(2)

(iii) The screw is made from hardened steel.

Explain why the screw must be hard.

.....

.....

(2)

(c) A company has decided to mass-produce a large number of pencil sharpeners using recycled materials for the casing.

Describe **two** benefits of using recycled materials.

1 .....

.....

2 .....

.....

(4)

Leave blank

(d) The pencil sharpener has been designed with built in obsolescence.

(i) Explain the meaning of the term *built in obsolescence.*

.....

.....

(2)

(ii) Give another example of a product which has built in obsolescence designed into it.

.....

(1)

(iii) Describe **two** features of the pencil sharpener which could be changed to prevent the product becoming obsolete.

1 .....

.....

2 .....

.....

(4)

(Total 22 marks)

BLANK PAGE

TURN OVER FOR QUESTION 3

Leave blank

3. A company is designing a new pull–along child's toy to be used in and outside of the home.

The specification of the toy is that it must:

- be safe for young children aged 2 to 4 years old;
- contain a mechanism that converts rotary to reciprocating movement;
- be able to withstand weathering;
- be made from materials that are suitable for mass production.

(a) In the spaces below use notes and sketches to show **two** ideas for the design of the product which meets this specification.

DESIGN IDEA 1

(8)

DESIGN IDEA 2

Leave blank

(8)

Leave blank

(b) Three of the initial specification points are given again below.

Use these headings to evaluate **one** of your designs against the initial specification.

Contain a mechanism that converts rotary to reciprocating movement.

.....

.....

.....

.....

Be able to withstand weathering.

.....

.....

.....

.....

Be made from materials that are suitable for mass production.

.....

.....

.....

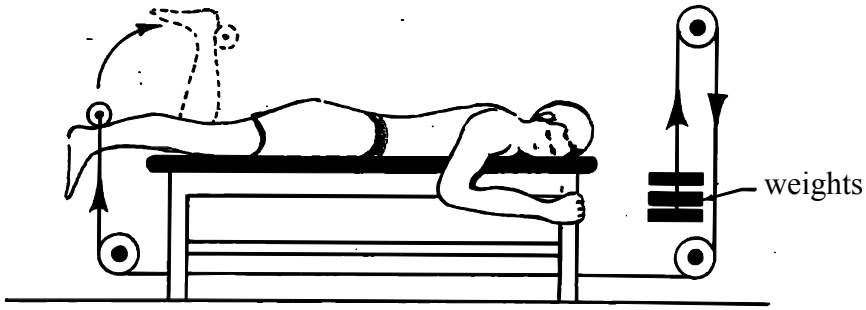
.....

(6)

(Total 22 marks)

Leave blank

4. The fitness device shown below uses a pulley and cable system to allow the user to carry out a leg curling exercise.



ADDITIONAL INFORMATION

Weights can be added and removed.

It is suitable for home use.

(a) Two specification points for the fitness device are:

- the fitness device must be suitable for a range of age groups;
- the fitness device must have a lightweight frame.

Give **three** more points of specification which could be included in the specification of the product. For each point, give a reason why it should be included.

1 .....

Reason .....

2 .....

Reason .....

3 .....

Reason .....

(6)

(b) Name the specific type of material suitable for making each of the following parts of the fitness device:

(i) The main framework .....

(ii) The weights .....

(iii) The bearings .....

(3)

Leave blank

(c) Give **one** property associated with **one** of the materials you have named in (b) and explain how this property makes it suitable for this application.

Property .....

Explanation .....

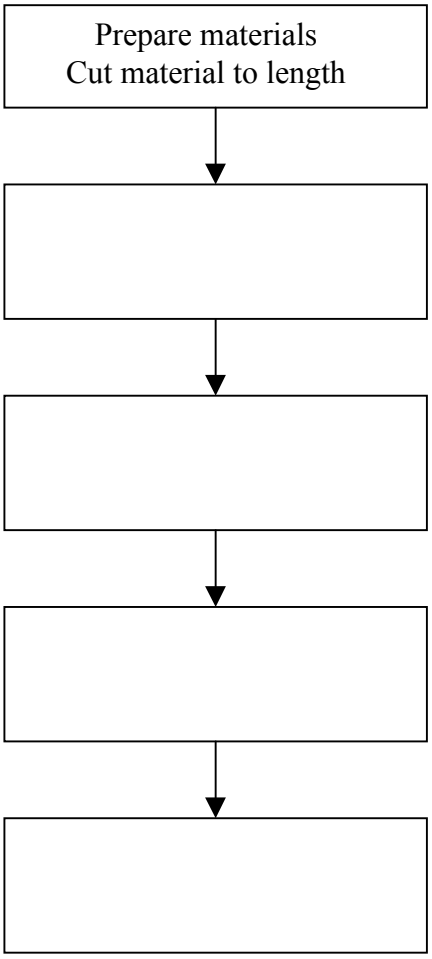
.....

.....

(4)

(d) The framework for a prototype of the exercise bench is to be made in a school workshop.

Complete the diagram below to show the main stages of making the frame.



(5)

(e) The purpose of this fitness device is to allow the user to carry out leg curling exercises.

Describe how the fitness device achieves this purpose.

.....

.....

.....

.....

(4)

(Total 22 marks)

Leave blank

PAPER TOTAL 88 MARKS

END

BLANK PAGE

Centre Number						Paper Reference	Surname
Candidate Number						Candidate Signature	Other Names

For Examiner's use only

For Team Leader's use

1974/4H

Edexcel GCSE

Design and Technology: Systems and Control (Mechanisms) (Full Course)

Paper 4H

HIGHER TIER

Specimen Paper

Time 1½ hours **N0000**

Materials required for the examination

None

Items included with these question papers

None

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your signature, your surname and other names. The paper reference is shown in the top left hand corner.

Attempt ALL questions using the spaces provided in the Question Paper.

Information for Candidates

You may use drawing equipment and coloured pencils.

All measurements are in millimetres unless otherwise stated.

Advice to Candidates

You are reminded of the importance of clear and orderly presentation in your answers.

Include diagrams where these are helpful.

Question Number	Leave Blank
1	
2	
3	
4	
Total	

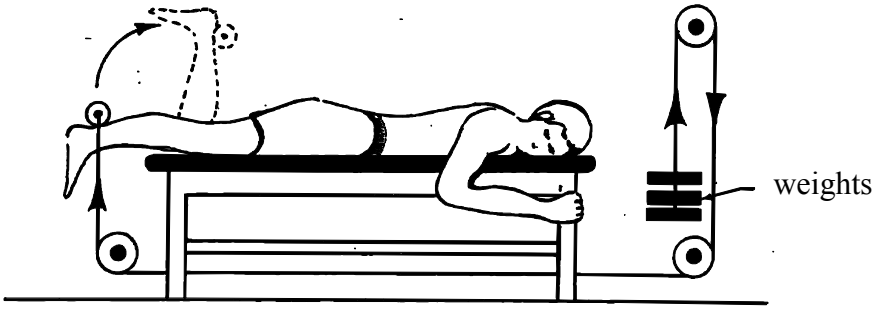
Turn over

Edexcel
Success through qualifications

Answer ALL questions in the spaces provided.

Leave blank

1. The fitness device shown below uses a pulley and cable system to allow the user to carry out a leg curling exercise.



ADDITIONAL INFORMATION

Weights can be added and removed.
It is suitable for home use.

(a) Two specification points for the fitness device are:

- the fitness device must be suitable for a range of age groups;
- the fitness device must have a lightweight frame.

Give **three** more points of specification which could be included in the specification of the product. For each point, give a reason why it should be included.

1 .....

Reason .....

2 .....

Reason .....

3 .....

Reason .....

(6)

(b) Name the specific type of material suitable for making each of the following parts of the fitness device:

(i) The main framework .....

(ii) The weights .....

(iii) The bearings .....

(3)

(c) Give **one** property associated with **one** of the materials you have named in (b) and explain how this property makes it suitable for this application.

Leave blank

Property .....

Explanation .....

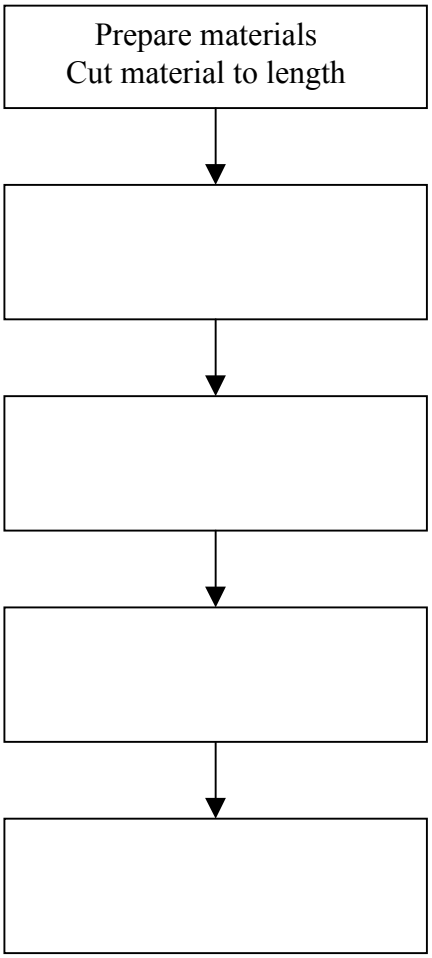
.....

.....

(4)

(d) The framework for a prototype of the exercise bench is to be made in a school workshop.

Complete the diagram below to show the main stages of making the frame.



(5)

(e) The purpose of this fitness device is to allow the user to carry out leg curling exercises.

Describe how the fitness device achieves this purpose.

.....

.....

.....

.....

(4)

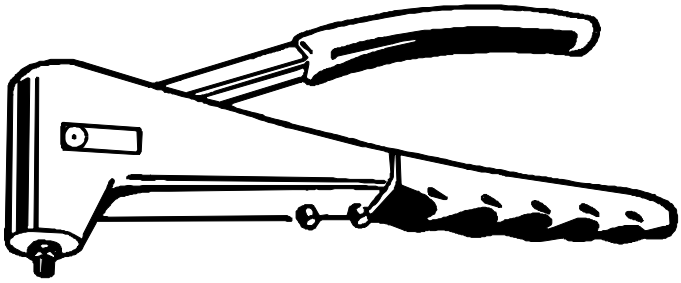
(Total 22 marks)

Leave blank

Leave blank

2. The pictures below show a standard POP rivet and a POP rivet gun.

POP rivet



POP rivet gun

(a) Give **two** reasons why this type of rivet is popular.

1 .....

2 .....

(2)

(b) In the space below use a simple line diagram to show the following parts of the lever mechanism used in the POP rivet gun:

(i) fulcrum;

(ii) direction and position of efforts.

(4)

(c) A force of 120N must be applied to the pop rivet to insert it into some sheet material. Along the handle, the distance from the fulcrum to the rivet is 50mm and the distance from the applied effort to the fulcrum is 150mm

Leave blank

Calculate the effort needed to be applied to produce the desired force on the rivet.

(3)

(d) Explain why, in small batch production, it might be better to weld thin sheets together rather than to use POP rivets.

.....

.....

.....

.....

(4)

(e) A small engineering company is considering buying a computerised system to order components from its suppliers.

Describe **two** ways in which this would help the company.

1 .....

.....

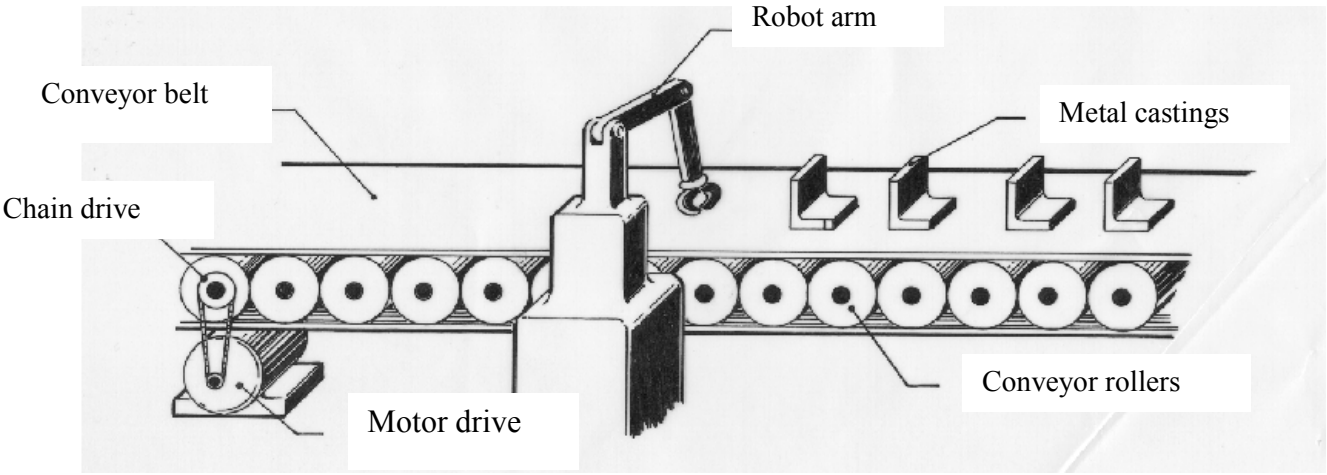
2 .....

.....

(4)

Leave blank

(f) The diagram below shows part of the production line for the high volume production of motor parts.



(i) Name **two** of the processes shown in the diagram that could be controlled by computers.

1 .....

2 .....

(2)

(ii) Explain how the use of CAM helps in the mass production of motor cars.

.....

.....

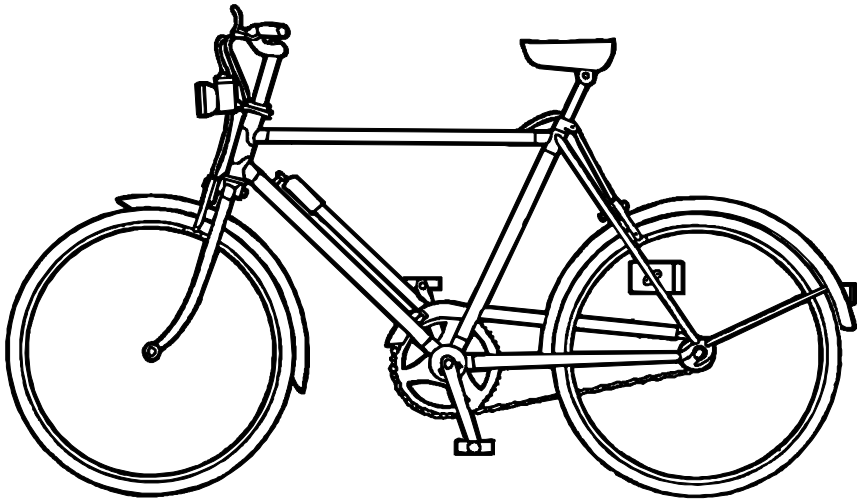
.....

(3)

(Total 22 marks)

Leave blank

3. The diagram below shows a bicycle.



(a) Name **one** place on the bicycle where friction occurs and is reduced by a mechanism and explain how this reduction is achieved.

Name.....

Explanation.....

.....

(3)

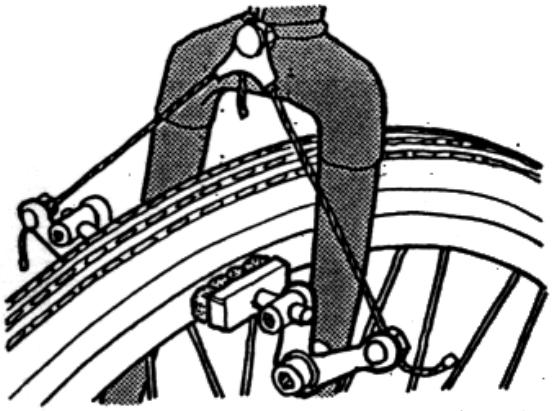
(b) The pedal sprocket has 100 teeth and the rear wheel sprocket has 20 teeth. The circumference of the rear wheel is 2.2 metres.

Calculate the distance the bicycle will travel for **one** rotation of the pedal sprocket. Show all your workings.

(4)

(c) The diagram below shows a braking arrangement for a bicycle wheel.

Leave blank



The type of lever used in the brake mechanism above is a bell crank.
Use notes and sketches to explain the operation of a bell crank lever.

(4)

(d) "The bicycle is an environmentally friendly and healthy form of transport".

Explain **three** reasons to support this statement.

1 .....

.....

2 .....

.....

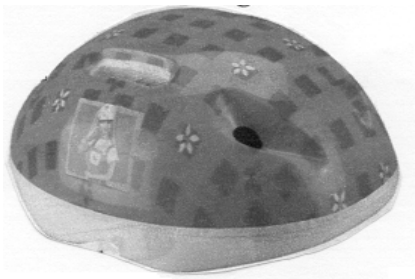
3 .....

.....

(6)

Leave blank

(e) The child's cycle helmet shown below is advertised and labelled as conforming to British Standards.



(i) Explain the meaning of *British Standards*.

.....

.....

(2)

(ii) Name the symbol you would expect to see on the helmet if it conforms to British Standards and explain why it would be considered unwise to buy a helmet that is not labelled as conforming to British Standards.

Name .....

Explanation .....

.....

(3)

(Total 22 marks)

Leave blank

4. A company is designing a new style computer bench. In order to conform with the Display Screen Equipment Regulations, the height of the bench must be adjustable.

The specification of the bench is that it must:

- be safe;
- be rigid;
- contain a mechanism to adjust the height of the bench;
- be mobile.

In the spaces below, use notes and sketches to show **two** ideas for the design of the product which meets this specification. Show clearly any mechanisms used to adjust the height of the bench and show how you intend to make your design mobile.

DESIGN IDEA 1

(8)

DESIGN IDEA 2

Leave blank

(8)

Leave blank

(b) Three of the initial specifications are given below.

Use these points to evaluate **one** of your designs against the initial specification.

Be rigid.

Contain a mechanism to adjust the height of the bench.

Be mobile.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(8)

(Total 22 marks)

PAPER TOTAL 88 MARKS

END

DESIGN & TECHNOLOGY: SYSTEMS & CONTROL TECHNOLOGY (ELECTRONICS) (1974/2F)
FULL COURSE FOUNDATION TIER MARK SCHEME

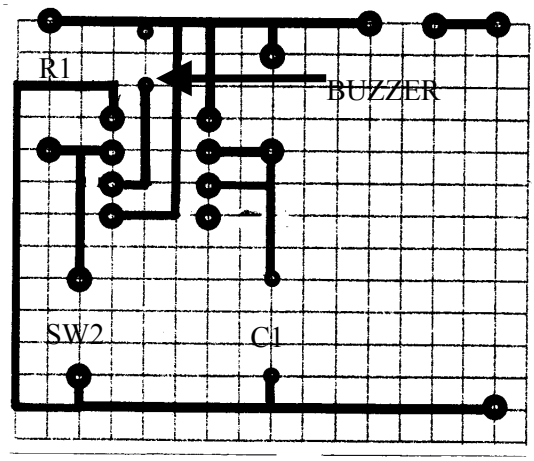
Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
1	**(a)**	**(i)**	Name: Side cutters Name: De-soldering Tool Name: Wire Strippers Name: Resistor Name: Seven segment display	**5 x 1**	
		(ii)	Use: Trimming and cutting component legs/wires to size Use: Removing unwanted solder from circuits Use: Removing plastic sheathing from wire Use: Limit current flow Use: Display number 0 – 9 by combinations of lines	**5 x 1**	**(10)**
	(b)	**(i)**	Accept any appropriate answer: Copper is good conductor of heat Copper gives up heat easily	**1**	**(1)**
		(ii)	Accept any 2 appropriate safety precautions: Use a soldering iron stand to prevent risk of burning Use a low voltage iron Avoid the flex being in contact with the bit	**2x1**	**(2)**
	(c)		Avoid soldering in draughts Heat the track and component leg together Feed solder into the joint not onto the bit Ensure joint is smooth and shiny	**3x1**	**(3)**
	(d)	**(i)**	A prototype circuit is built to 'test' a circuit design for function	**2x1**	**(2)**
		(ii)	Accept any two advantages: PCB allows accurate repetition of circuit boards using photo-etch PCB circuit designs allow the effective use of space Multiple circuits can be printed onto a single piece of PCB	**2x2**	**(4)**
					(22)
2	**(a)**	**(i)**	Lamp	**1**	**(1)**
		(ii)	Light sensor / LDR & resistor / Potential Divider Transistor Lamp / Component A	**3x1**	**(3)**
		(iii)	Resistor R2 protects the transistor by limiting current flow into it. Award 1 mark for mention of protecting transistor	**2x1**	**(2)**

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
		(iv)	As darkness increases, the resistance of 'LDR' increases, causing the voltage at 'X' to rise	**3x1**	**(3)**
		(v)	Replace R1 with a potentiometer/variable resistor	**2**	**(2)**
	(b)	**(i)**	Accept any appropriate examples	**2x1**	**(2)**
		(ii)	Description should include an understanding of the function of the example relative to its benefits	**2x2**	**(4)**
	(c)	**(i)**	Accept any appropriate named products	**2x1**	**(2)**
		(ii)	Accept any appropriate explanation based on: Cost effectiveness Planned obsolescence Time factors	**3x1**	**(3)**
					(22)
3	**(a)**		**DESIGN IDEA 1** Each specification point resolved in design (fully = 2, partly = 1)	**4x2**	**(8)**
			DESIGN IDEA 2 Each specification point resolved in design (fully = 2, partly = 1)	**4x2**	**(8)**
	(b)		Each point clearly evaluated (fully =2, partly =1)	**3x2**	**(6)**
					(22)
4	**(a)**		Accept any three relevant points of specification and reason, eg: Point: Must be comfortable to hold in one hand Reason: for ease of use Point: Must operate from a PP3 9V battery Reason: to keep size down/provide power Point: The LED must be large enough and bright Reason: for clear indicator Point: The back should detach easily Reason: for easy access to battery	**6x1**	**(6)**
	(b)	**(i)**	Any appropriate plastic eg ABS, polystyrene	**1**	
		(ii)	Any appropriate metal eg brass, aluminium, steel	**1**	
		(iii)	Any appropriate material eg acrylic, MDF	**1**	**(3)**

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
	(c)		Accept any appropriate property of the selected material – the description should relate to the specific application of the material in this instance: Eg Contacts made from brass – good electrical conductor, can be threaded for fixing to case or nut, will not rust, can be machined easily, retains a good finish.	**1 + 3**	**(4)**
	(d)		Place plastic sheet in vacuum forming machine – make airtight Heat plastic sheet until soft Form the required shape Cool the moulding Release moulding and trim Correct sequence	**4x1** **1**	**(5)**
	(e)		When 'good' fuse is placed across the contacts, the base of the transistor is connected to +V. This causes it to turn on and the current flow through the LED making it light to indicate the fuse is in good condition. A broken fuse will not make a connection with +V so the LED will not light.	**2x2**	**(4)**
					(22)
			TOTAL FOR PAPER 88 MARKS		

DESIGN & TECHNOLOGY: SYSTEMS & CONTROL TECHNOLOGY (ELECTRONICS) (1974/2H)
FULL COURSE HIGHER TIER MARK SCHEME

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
1	**(a)**		Accept any three relevant points of specification and reasons eg: Point: Must be comfortable to hold in one hand Reason: for ease of use Point: Must operate from a PP3 9V battery Reason: to keep size down Point: The LED must be large enough and bright Reason: for clear indicator Point: The back should detach easily Reason: for easy access to battery	**6x1**	**(6)**
	(b)	**(i)**	Any appropriate plastic eg ABS, polystyrene	**1**	
		(ii)	Any appropriate metal eg brass, aluminium, steel	**1**	
		(iii)	Any appropriate material eg acrylic, MDF	**1**	**(3)**
	(c)		Accept any appropriate property of the selected material – the description should relate to the specific application of the material in this instance: Eg Contacts made from brass – good electrical conductor, can be threaded for fixing to case or nut, will not rust, can be machined easily, retains a good finish.	**1 + 3**	**(4)**
	(d)		Place plastic sheet in vacuum forming machine – make airtight Heat plastic sheet until soft Form the required shape Cool the moulding Release moulding and trim Correct sequence	**4x1** **1**	**(5)**
	(e)		When 'good' fuse is placed across the contacts, the base of the transistor is connected to +V. This causes it to turn on and the current flow through the LED making it light to indicate the fuse is in good condition. A broken fuse will not make a connection with +V so the LED will not light.	**2x2**	**(4)**
					(22)

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
2	**(a)**	**(i)**	Accept any 3 appropriate reasons eg: Allows both hands free for soldering Heavy base enables stability Adjustable for different sized boards	**3x1**	**(3)**
		(ii)	Accept any 2 appropriate answers eg: Clamps circuit boards securely Allows boards to be rotated through any angle Magnifier allows detailed inspection of soldered joint	**2x1**	**(2)**
	(b)		Accept any 3 appropriate safety precaution eg: Wear goggles Wear gloves Work in good ventilation	**3x1**	**(3)**
	(c)		 Components R1, BUZZER, SW2, C1 identified in correct position Pin 1 to 0V Pin 3 to 1st Leg of Buzzer 2nd Leg of Buzzer to +V Pin 4 to +V Pin 6 connected to pin 7 Pins 6 & 7 to 1st Leg of capacitor 2nd Leg of capacitor to 0V Pin 8 to +V	**4x1** **1** **1** **1** **1** **1** **1** **1** **1**	**(12)**
	(d)		Wide tracks – better conductors, less likely to have breaks Less copper to etch off PCB	**2x1**	**(2)**
					(22)

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
3	**(a)**	**(i)**	Resistor R protects the LED / current limiting resistor	**1**	**(1)**
		(ii)	R = V/I R = 7/0.01 (Amp) R = 700R (answer must include units) Accept nearest preferred value	**1** **1** **1**	**(3)**
	(b)		Sketch of LED showing: One leg shorter than the other Flat on rim of LED Short leg next to 'flat' Correctly labelled	 **1** **1** **1** **1**	**(4)**
	(c)		Sketch showing mark/space ratio is the relationship between time on and time off of the astable	**3x1**	**(3)**
	(d)	**(i)**	Accept any 2 appropriate benefits described eg: Wide range of cheaper products Consistently high build quality	**2x2**	**(4)**
		(ii)	Accept any 2 appropriate reasons related to (d)(i) explained eg: High speed output means more products produced in a shorter time – so can be sold more cheaply. Very accurate repeatability – computer controlled machinery produce very tight tolerances	**2x2**	**(4)**
		(iii)	Accept any appropriate disadvantage eg: Less skilled jobs available in manufacturing industry through use of CNC machinery	**1**	**(1)**
			Explanation related to: more training necessary no longer job for life different skills required	**2x1**	**(2)**
					(22)
4	**(a)**		**DESIGN IDEA 1** Each specification point resolved in design. (fully = 2, partly = 1)	**4x2**	**(8)**
			DESIGN IDEA 2 Each specification point resolved in design. (fully = 2, partly = 1)	**4x2**	**(8)**
	(b)		Each point clearly evaluated (fully =2, partly =1)	**3x2**	**(6)**
					(22)
			TOTAL FOR PAPER 88 MARKS		

DESIGN & TECHNOLOGY: SYSTEMS & CONTROL TECHNOLOGY (MECHANISMS) (1974/4F)
FULL COURSE FOUNDATION TIER MARK SCHEME

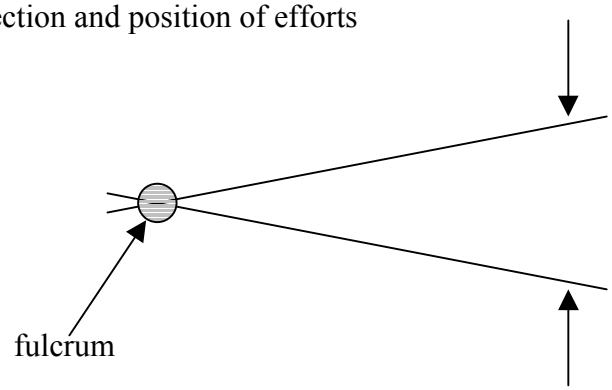
Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
1	**(a)**	**(i)**	Name: Nut & bolt. Name: posidriv woodscrew Name:locking/spring washer Name: spur gear Name: pear cam	**5x1**	
		(ii)	Use: holding components together Use: general woodworking joints Use: to prevent nuts from working loose due to vibration Use: increasing/decreasing rotational speeds Use: converts rotary to linear motion	**5x1**	**(10)**
	(b)	**(i)**	Class one lever	**1**	**(1)**
		(ii)	Description should provide information regarding the screw mechanism, how the rotary movement of the fixed nut allows the screw to travel in a linear direction	**3x1**	**(3)**
		(iii)	Answers such as: avoids spanner slipping off nut, causing damage and wear to corners of the nut, as well as possible injury to the spanner user.	**2x1**	**(2)**
	(c)		Components and parts made to standard sizes and are interchangeable	**2x1**	**(2)**
	(d)	**(i)**	Fixings that allow joints to be taken apart with ease (nuts, bolts, screws etc.)	**2x1**	**(2)**
		(ii)	Fixings whose joints are permanently fixed (welding)	**2x1**	**(2)**
					(22)
2	**(a)**	**(i)**	Plastic, thermoplastic, or named plastic, also accept aluminium	**2x1**	**(2)**
		(ii)	Steel or stainless steel	**1**	**(1)**
		(iii)	Hardness	**1**	**(1)**
	(b)	**(i)**	Drawing correctly identifies parts: root diameter, the crest diameter & the pitch of the thread.	**3x1**	**(3)**
		(ii)	Only requires a drilled hole, no tapping or screw thread required, fewer tools needed, reduced costs.	**2x1**	**(2)**
		(iii)	Explanation which makes reference to: Allows screw to cut into material – hardened steel will not suffer any wear when cutting into other, softer materials.	**2x1**	**(2)**
	(c)		Description of any two of: Cost, environmental advantages: less demand for natural resources, answers related to global warming, deforestation etc.	**2x2**	**(4)**

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
	(d)	**(i)**	Explanation which makes reference to: Products designed to have a short life, by material or component breakage or failure, inability of product to be repaired,	**2x1**	**(2)**
		(ii)	Any suitable example	**1**	**(1)**
		(iii)	Description of any two features from: Blade could be sharpened or replaced, body of pencil sharpener could be made out of sturdy material	**2x2**	**(4)**
					(22)
3	**(a)**		**DESIGN IDEA 1** Each specification point resolved in design. (fully = 2, partly = 1)	**4x2**	**(8)**
			DESIGN IDEA 2 Each specification point resolved in design. (fully = 2, partly = 1)	**4x2**	**(8)**
	(b)		Each point clearly evaluated (fully =2, partly =1)	**3x2**	**(6)**
					(22)
4	**(a)**		Accept any three related specification points and reason, examples given below: Point: Strong, Reason: to withstand user weight Point: Robust Reaon: to be long lasting Point: Portable Reason: to allow it to be moved easily	**6x1**	**(6)**
	(b)	**(i)**	steel or aluminium tube	**1**	
		(ii)	cast iron	**1**	
		(iii)	Nylon, bronze, also accept brass	**1**	**(3)**
	(c)		*1 mark for property, 3 marks for explanation* Answers linked to: Steel tube – toughness, durability, strong, lightweight Aluminium tube – strength to weight ration Cast iron – heavy Nylon – wearability, coefficient of friction. Positive frictional properties for sliding. Brass / Bronze – similar to nylon (frictional properties) also relating to wear, non-corrosive.	**1 + 3**	**(4)**

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
	(d)		Mark out and prepare joints Clamp corners in position Weld, braze or assemble corner joints Clean joint area and finish by painting *Consider other sensible stages of production* Correct sequence	**4x1** **1**	**(5)**
	(e)		Answer should describe how the machine and person interact during the exercise motion. Reference to load, fixed pulleys and weights.	**2x2**	**(4)**
					(22)
			TOTAL FOR PAPER 88 MARKS		

DESIGN & TECHNOLOGY: SYSTEMS & CONTROL TECHNOLOGY (MECHANISMS) (1974/4H)
FULL COURSE HIGHER TIER MARK SCHEME

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
1	**(a)**		Accept any three related specification points and reason, examples given below: Point: Strong, Reason: to withstand user weight Point: robust Reason: to be long lasting Point: portable Reason: to allow it to be moved easily	**6x1**	**(6)**
	(b)	**(i)**	Steel or aluminium tube	**1**	
		(ii)	Cast iron	**1**	
		(iii)	Nylon, bronze also accept brass	**1**	**(3)**
	(c)		*1 mark for property, 3 marks for explanation* Acceptable answers linked to Steel tube – toughness, durability, strong, lightweight Aluminium tube – strength to weight ration Cast iron – heavy Nylon – wearability, coefficient of friction. Positive frictional properties for sliding. Brass / Bronze – similar to nylon (frictional properties) also relating to wear, non-corrosive.	**1+3**	**(4)**
	(d)		Mark out and prepare joints Clamp corners in position Weld, braze or assemble corner joints Clean joint area and finish by painting *Consider other sensible stages of production* Correct sequence	**4x1** **1**	**(5)**
	(e)		Answer should describe how the machine and person interact during the exercise motion. Reference to load, fixed pulleys and weights.	**2x2**	**(4)**
					(22)

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
2	**(a)**		Possible answers include: • Ease of use • Access only required from one side of component • Quick action • Suitable for batch production • Low cost. *Accept other reasons where examples are given*	**2x1**	**(2)**
	(b)		Diagram which shows: Fulcrum Direction and position of efforts  	 **2** **2**	**(4)**
	(c)		Calculation: 120 x 50 = F x 150 $F = \frac{120 \times 50}{150}$ = 40N (Unit = 1 mark)	**1** **1+1**	**(3)**
	(d)		Answers should focus on main advantages relating to cost and time. Cost of production time using rivets and the time taken to assemble. Number of stages of production increased using POP rivets. Welding can provide greater strength, can create continuous joint. Welding can be carried out with greater speed using automated techniques. Riveting requires extra process – the drilling of holes, therefore increases production costs.	**2x2**	**(4)**
	(e)		Software can retain lists of order numbers for components, order forms ready to use and adapt. Orders can be made using electronic mail (e-mail). *Similar answers relating to efficiency in ordering and that time saves money.*	**2x2**	**(4)**

Qu.	Prt Qu.	Sub Qu.	Detailed Possible Answers	Mark Alloc.	Sub. Total
	(f)	**(i)**	The control of the motor and speed of the conveyor belt. The robot arm and its functions.	**2x1**	**(2)**
		(ii)	Explanation makes reference to: cost, speed, safety and quality of production. Points that might be noted include computer operated machines do not need sleep or tea breaks, they do not get tired and operate effectively and efficiently for long periods of time.	**3x1**	**(3)**
					(22)
3	**(a)**		Any appropriate part of bicycle eg Pedal to crank Front wheel Explanation which make reference to ball bearings etc	**1** **2**	**(3)**
	(b)		Calculation: O/P Ratio = I/P / O/P O/P Ratio = 100/20 = 5 Distance = O/P Ratio x Circumference 5 x 2.2 = 11 metres	 **1** **1** **1** **1**	**(4)**
	(c)		Notes and sketches explaining operation with reference to load, effort and how effort converts movements through 90°.	**2x2**	**(4)**
	(d)		Explanation makes reference to: Non-polluting, no fumes as from the motor car etc. Improves and maintains general fitness of rider, cost effective, easily maintained, no need for fuels.	**3x2**	**(6)**
	(e)	**(i)**	In this case the safety helmets have been designed and tested to an approved standard of performance.	**2**	**(2)**
		(ii)	Kite Mark Buying a helmet without any clear indication of quality can result in it failing to provide the user with the expected protection.	**1** **2**	**(3)**
					(22)
4	**(a)**		**DESIGN IDEA 1** Each specification point resolved in design. (fully = 2, partly = 1)	**4x2**	**(8)**
			DESIGN IDEA 1 Each specification point resolved in design. (fully = 2, partly = 1)	**4x2**	**(8)**
	(b)		Each point clearly evaluated (fully =2, partly =1)	**3x2**	**(6)**
					(22)
			TOTAL FOR PAPER 88 MARKS		

DESIGN & TECHNOLOGY: SYSTEMS & CONTROL TECHNOLOGY (ELECTRONICS/MECHANISMS) (1974) - SPECIFICATION GRID

ELECTRONICS

PAPER 2F				
Quest	**Assessment objective tested**	**Content covered by question**	**Question style/type**	**Marks**
1	AO1	Preparing, processing and finishing materials and manufacturing commercial products	Structured question on a theme.	**Total 22**
2	AO1 + AO3	Classification and selection of materials and components. Design and market influence, parts (i) and (ii) not covered in question 3.	Structured question on a theme.	**11 + 11** **Total 22**
3	AO2	Design question. This question accounts for **all** 10% of designing marks.	Design question – candidates design a product from a specification and evaluate against the specification.	**Total 22**
4	AO3	Design and market influence, part (iii).	Product analysis – candidates are asked to analyse a product following the analysis process.	**Total 22**
PAPER 2H				
Quest	**Assessment objective tested**	**Content covered by question**	**Question style/type**	**Marks**
1	AO3	Design and market influence, part (iii).	Product analysis – candidates are asked to analyse a product following the analysis process.	**Total 22**
2	AO1	Preparing, processing and finishing materials and manufacturing commercial products	Structured question on a theme.	**Total 22**
3	AO1 + AO3	Classification and selection of materials and components. Design and market influence, parts (i) and (ii) not covered in question 3.	Structured question on a theme.	**11 + 11** **Total 22**
4	AO2	Design question. This question accounts for **all** 10% of designing marks.	Design question - candidates design a product from a specification and evaluate against the specification.	**Total 22**

MECHANISMS

PAPER 4F				
Quest	**Assessment objective tested**	**Content covered by question**	**Question style/type**	**Marks**
1	AO1	Preparing, processing and finishing materials and manufacturing commercial products	Structured question on a theme.	**Total 22**
2	AO1 + AO3	Classification and selection of materials and components. Design and market influence, parts (i) and (ii) not covered in question 3.	Structured question on a theme.	**11 + 11** **Total 22**
3	AO2	Design question. This question accounts for **all** 10% of designing marks.	Design question – candidates design a product from a specification and evaluate against the specification.	**Total 22**
4	AO3	Design and market influence, part (iii).	Product analysis – candidates are asked to analyse a product following the analysis process.	**Total 22**
PAPER 4H				
Quest	**Assessment objective tested**	**Content covered by question**	**Question style/type**	**Marks**
1	AO3	Design and market influence, part (iii).	Product analysis – candidates are asked to analyse a product following the analysis process.	**Total 22**
2	AO1	Preparing, processing and finishing materials and manufacturing commercial products	Structured question on a theme.	**Total 22**
3	AO1 + AO3	Classification and selection of materials and components. Design and market influence, parts (i) and (ii) not covered in question 3.	Structured question on a theme.	**11 + 11** **Total 22**
4	AO2	Design question. This question accounts for **all** 10% of designing marks.	Design question - candidates design a product from a specification and evaluate against the specification.	**Total 22**

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481

Order Code UG 009338
Summer 2000

For more information on Edexcel qualifications please contact our
Customer Response Centre on 0870 240 9800
or email: enquiries@edexcel.org.uk
or visit our website: www.edexcel.org.uk

Edexcel Foundation is a registered charity and a company limited
by guarantee. Registered in England No. 1686164

Edexcel
Success through qualifications