Candidate Name	Centre Number	Candidate Number

OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
General Certificate of Secondary Education

DESIGN AND TECHNOLOGY (SYSTEMS AND CONTROL TECHNOLOGY)

1957/2

PAPER 2 HIGHER TIER

Specimen Paper 2003

1 hour 15 minutes

Additional materials:
Formulae Sheet OCR (Tables 2)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.
Show all your working out for calculations.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
Marks will be awarded for the use of correct conventions.
Dimensions are in millimetres unless stated otherwise.
Total marks for this paper is **50**.

Question Number	For Examiner's use only
1	
2	
3	
4	
5	
TOTAL	

This specimen question paper consists of 12 printed pages.

Registered Charity Number: 1066969
[Turn over

1 Fig. 1 shows a bathroom modified for use by a disabled person.
Fig. 2 shows a shower height adjustment handle.

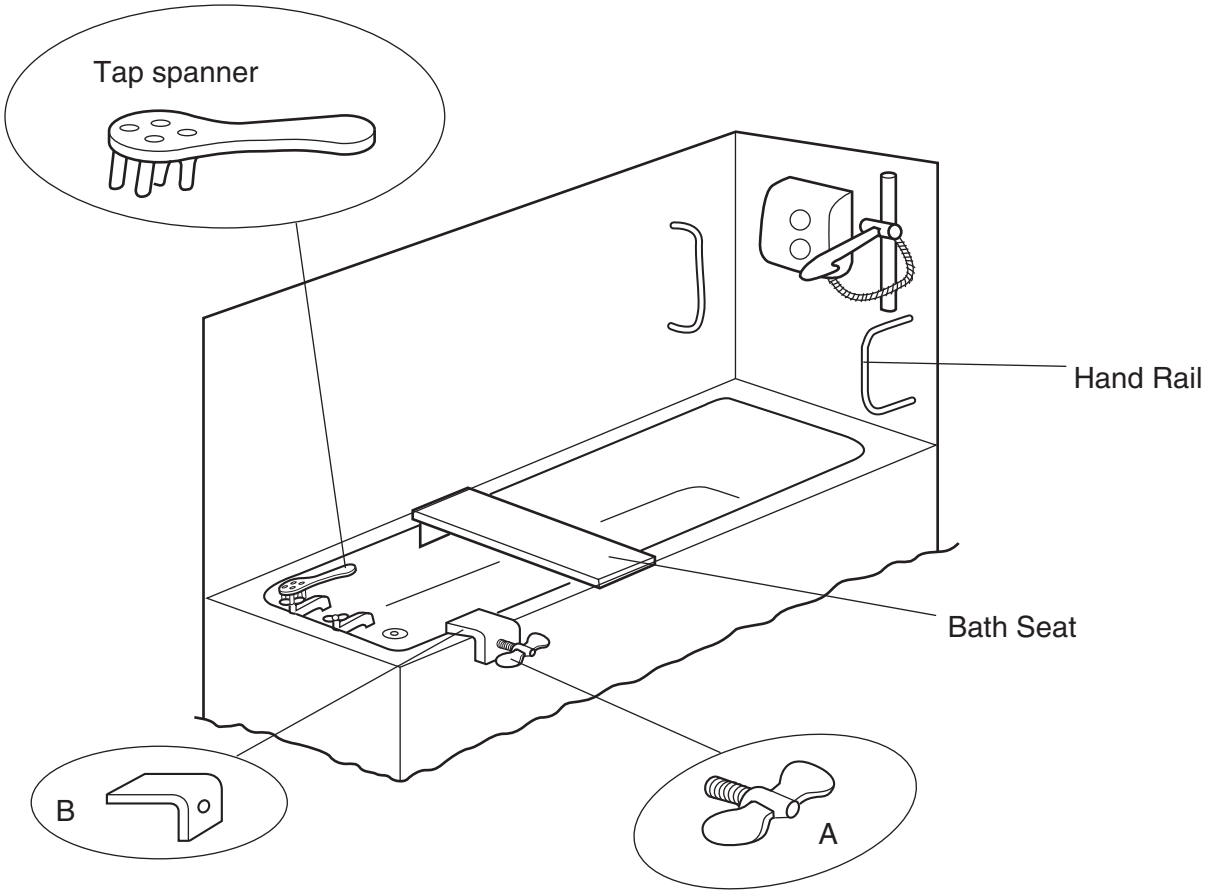

Fig. 1

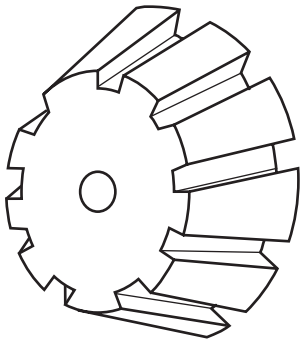

Fig. 2

(a) The shower adjustment handle is produced by repetitive flow production.
Describe what is meant by the term repetitive flow.

_____

_____

_____[2]

(b) From the list below underline the process best suited to manufacturing the shower adjustment handle.

Injection moulding,

Vacuum forming,

Machined from solid. [1]

(c) The shower adjustment handle was designed using CAD systems.
Describe **one** benefit to the designer of using CAD.

_____

_____[2]

(d) Fig. 3 shows a set screw used in the assembly of the shower unit.
The setscrew could be made using CAM.

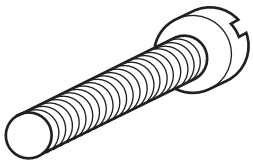

Fig. 3

(i) Give **one** benefit, other than costs, to the manufacturer of using CAM systems.

_____

_____[1]

(ii) Give **one** benefit, other than cost, to the consumer of the setscrew being made using CAM systems.

_____

_____[1]

(iii) Give **one** example of the use of CAD/CAM to make a one off artefact.

_____

_____[1]

(e) When designing the shower unit the designer wished to make the product environmentally friendly.
Describe **one** way in which the product could be so made.

_____

_____

_____

_____[2]

[Total marks : 10]

2 Fig. 4 shows a tap spanner used to make turning a tap on and off easier.

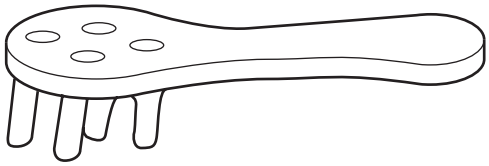

Fig. 4

(a) Explain how the spanner makes turning the tap on and off easier.

_____

_____

_____

_____[2]

(b) Add **three** design specification points to the list given below.

- must not corrode,
- must be attractive to look at,
- must be appropriately priced for the intended users,
- _____

  _____[1]
- _____

  _____[1]
- _____

  _____[1]

(c) Explain how a designer would use anthropometric data when designing a tap spanner.

_____

_____

_____

_____[2]

(d) The tap spanner is being manufactured in batches of 25.
Describe a way of assuring quality of the spanners.

_____

_____

_____

_____[2]

(e) State **one** physical property of the material used for the spanner that would be important to its function.

_____

_____[1]

[Total marks : 10]

3 Fig. 5 shows the circuit diagram for a temperature alarm used to warn that the temperature for the bath water is too hot.

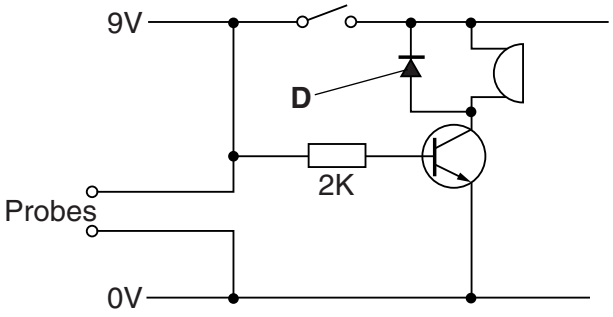

Fig. 5

(a) State a component that could be used to sense change in temperature.

_____[1]

(b) Different people may prefer their bath water to be different temperatures.
Explain how the circuit design could be modified to make the alarm setting adjustable.

_____

_____

_____

_____[2]

(c) Show, using sketches and notes, how the temperature probe could be protected from damage by the bath water.

[3]

(d) A 9 V battery powers the temperature alarm.

(i) Give one benefit to the user of powering the alarm with a battery.

_____

_____[1]

(ii) It is decided to modify the circuit so that either sound or light can alert the person when the required temperature is reached. Show by underlining the appropriate switch to be used to switch between either sound or light.

SPST,

SPDT,

DPST,

DPDT, [1]

(e) For the LED in the temperature alarm it is necessary to limit the current flowing through it to 30 mA. If the voltage across the LED is 3V calculate the power used by the LED.

_____

_____

_____

_____[2]

[Total marks : 10]

4 Fig. 6 shows detail of a shower curtain rail and its mounting bracket.

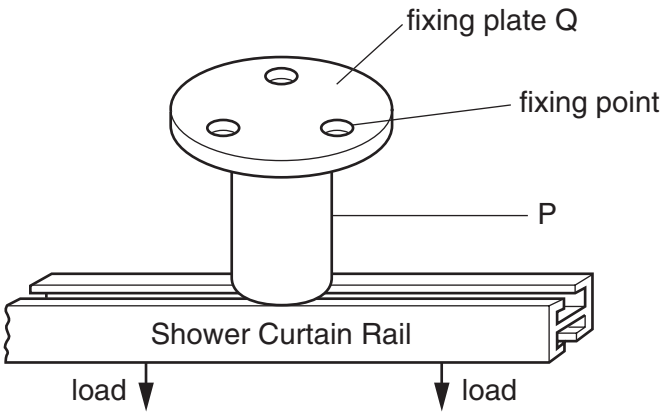

Fig. 6

(a) State the type of force acting in the part P.

_____[1]

(b) Explain the reasons why the fixing plate Q has three equally spaced fixing points.

_____

_____

_____

_____[2]

(c) Sketch a suitable method of attaching the mounting bracket to the shower curtain rail. Your design must allow the mounting bracket to be positioned at any given point on the rail.

[2]

(d) Fig. 7 shows detail of the gear system used in a bath seat winch.

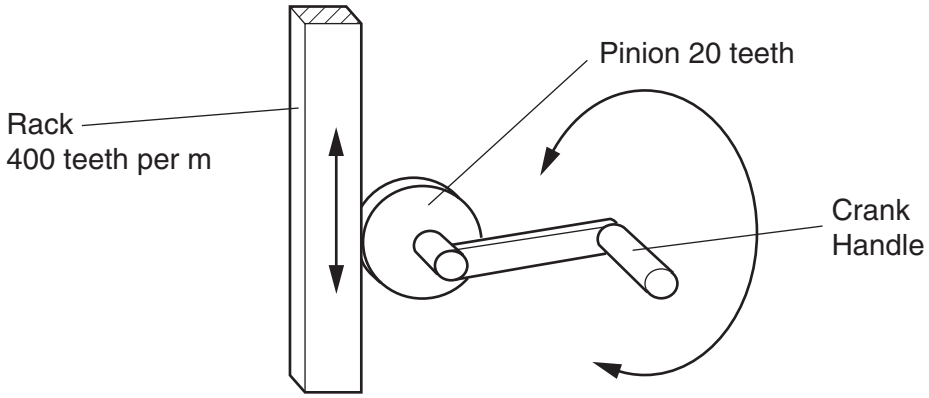

Fig. 7

(i) For the given gear ratio, calculate the number of turns needed by the crank handle to move the rack gear 50 mm.

_____

_____

_____

_____[2]

(ii) Describe the motion conversions taking place during the use of this gear system.

_____

_____[2]

(c) State one way that this gear system could be modelled during designing.

_____

_____[1]

[Total marks : 10]

5 Some people have difficulty holding a toothbrush.

(a) Use sketches and notes to show a design for an adaptor that will enable a standard toothbrush to be held in the hand securely.

[4]

(b) List three important features that have been included in the design of the adaptor that you have sketched in part **(a)**.

- _____

  _____[1]

- _____

  _____[1]

- _____

  _____[1]

(c) The handle of a toothbrush is produced by injection moulding.

(i) Explain why this process is appropriate for the manufacture of this product.

_____

_____

_____

_____[2]

(ii) State the type of commercial production method that would be used in the production of toothbrushes.

_____

_____[1]

[Total marks : 10]

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MARK SCHEME

Specimen Paper 2003

This mark scheme consists of 5 printed pages and 1 cover sheet.

Registered Charity Number: 1066969

[Turn over

1	**(a)**	Large numbers of identical products made as cheaply as possible on a continuous basis.	[1] [1]		
			2 x [1]		[2]
	(b)	Injection moulding	1 x [1]		[1]
	(c)	Changes can be made quickly and easily.	[1]		
		Changes can be modelled on screen for visualisation.	[1]		
			2 x [1]		[2]
	(d) **(i)**	Quality assurance Product consistency	[1] [1]		
			1 x [1]		[1]
	(ii)	Confidence in product Ensured accuracy	[1] [1]		
			1 x [1]		[1]
	(iii)	Modelling of scaled prototypes Toolmaking	[1] [1]		
			1 x [1]		[1]
	(e)	Use recyclable materials Ensure energy efficiency of plant keep materials down to bare minimum	[1] [1] [1]		
			2 x [1]		[2]
				[Total marks : 10]	

2 **(a)** Provides improved leverage [1]
and is easier to grip [1]
2 x [1] [2]

(b) easy to grip [1]
safe to use [1]
must not damage tap [1]
must fit a range of taps [1]
lightweight [1]

3 x [1] [3]

(c) To design [1] and form the hand grip
anthropometric data would be needed [1]

2 x [1] [2]

(d) Checking against templates [1]
at all stages of the production run [1]

2 x [1] [2]

(e) Good tensile strength [1]
Toughness [1]
Flexibility [1]
Elasticity [1]

1 x [1] [1]

[Total marks : 10]

3	**(a)**	Thermistor	1 x [1]	[1]
	(b)	By using variable resistor to adjust the biasing of the Transistor	[1] [1]	
			2 x [1]	[2]
	(c)	Method feasible for situation? Sketches and labels used? Quality of response	[1] [1] [1]	
			3 x [1]	[3]
	(d)	**(i)** Safer More compact	[1] [1]	
			1 x [1]	[1]
		(ii) SPDT	[1]	
			1 x [1]	[1]
	(e)	P = 1 V P = 30 mA x 3 V	[1]	
			2 x [1]	[2]
				[Total marks : 10]

4	**(a)**	Tension [1]; Tensile [1]; Stretching [1]	1 x [1]	[1]
	(b)	To spread	[1]	
		the load acting on the mount/ceiling	[1]	
			2 x [1]	[2]
	(c)	Locates in slot	1 x [1]	
		Locking method to rail	1 x [1]	[2]
	(d)	**(i)** 50 mm = 1/20 m		
		1/20 x 400 teeth per m = 80 teeth	[1]	
		pinion must turn 80 ÷ 20 teeth = 4 times	[1]	
			2 x [1]	[2]
		(iii) Rotary [1] to linear [1] motion	2 x [1]	
	(e)	Meccano [1]; Fisher Tech [1]; Tech. Lego [1]	1 x [1]	[1]
				[Total marks : 10]

5	**(a)**	Sketches and labels used?	[1]		
		Satisfies design need?	[1]		
		Fits range of toothbrushes?	[1]		
		Quality of response	[1]		
			4 x [1]		[4]
	(b)	Must fit range of common toothbrushes	[1]		
		Must aid holding of toothbrush	[1]		
		Easy to use	[1]		
		Safe to use	[1]		
		Waterproof	[1]		
			3 x [1]		[3]
	(c) **(i)**	Can produce many products	[1]		
		quickly	[1]		
		cheaply	[1]		
		range of colours easy to produce	[1]		
			2 x [1]		[2]
	(ii)	Repetitive flow	[1]		
			2 x [1]		[2]
			1 x [1]		[1]

[Total marks : 10]