



22136206

**DESIGN TECHNOLOGY  
STANDARD LEVEL  
PAPER 3**

Friday 17 May 2013 (morning)

1 hour

Candidate session number

0	0								
---	---	--	--	--	--	--	--	--	--

Examination code

2	2	1	3	-	6	2	0	6
---	---	---	---	---	---	---	---	---

**INSTRUCTIONS TO CANDIDATES**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions from one of the Options.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is [30 marks].



0132

**Option A — Food science and technology**

**A1.** Figure A1 shows a range of craft-produced breads.

**Figure A1: Craft-produced breads**



[Source: [http://commons.wikimedia.org/wiki/File:Various\\_grains.jpg](http://commons.wikimedia.org/wiki/File:Various_grains.jpg)]

(a) State **one** reason why craft-produced breads are generally more expensive than mass-produced breads. [1]

.....

.....

(b) Outline how gluten in flour contributes to the final texture of dough. [2]

.....

.....

.....

.....

*(This question continues on the following page)*



0232

*(Question A1 continued)*

- (c) Explain how the addition of yeast to bread dough contributes to the physical properties of bread. [3]

.....

.....

.....

.....

.....

.....



A2. (a) State **one** function of primary packaging of food products.

[1]

.....  
.....

(b) Outline **one** benefit of using biodegradable material for food packaging.

[2]

.....  
.....  
.....  
.....



0432

A3. Figure A2 shows “The eatwell plate” which has been developed by the Food Standards Agency, a statutory agency in the United Kingdom.

Figure A2: The eatwell plate



[Source: © Crown copyright. Public Health England in association with the Welsh Government, the Scottish Government and the Food Standards Agency in Northern Ireland.]

(a) Outline **one** reason why it is important that governments raise public awareness of food-related health issues. [2]

.....

.....

.....

.....

(b) Identify **one** reason why “The eatwell plate” system would not be appropriate for children below the age of two years. [2]

.....

.....

.....

.....



**A4.** Outline **one** reason why values of body mass index (BMI) might be misleading. [2]

.....

.....

.....

.....

**A5.** Explain how travel and the media have promoted the development of an international cuisine. [6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

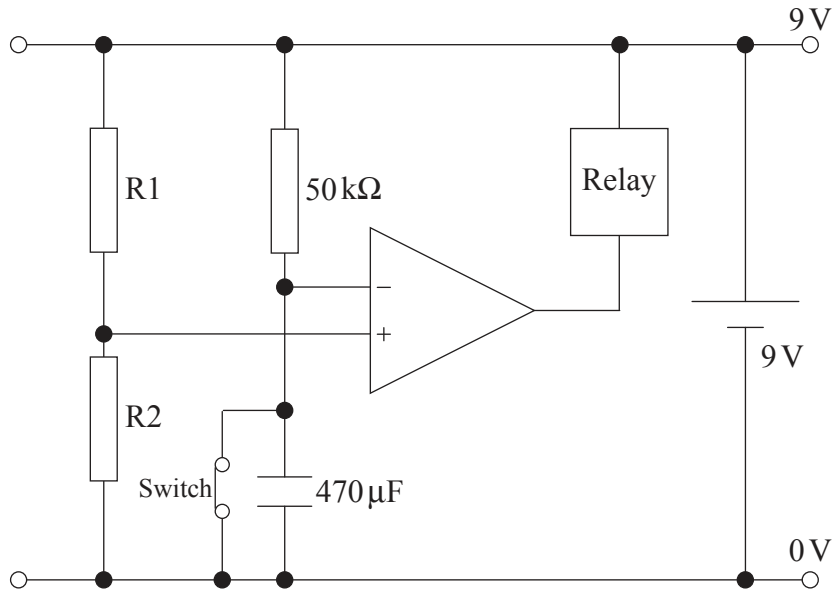




**Option B — Electronic product design**

**B1.** **Figure B1** shows a circuit designed to operate a relay. The circuit could be used to activate an alarm system and could be incorporated into a home security system. The switch is initially closed.

**Figure B1: A circuit designed to operate a relay**



(a) State the type of circuit shown in **Figure B1**. [1]

.....

.....

(b) Calculate the time constant for the circuit. [2]

.....

.....

.....

.....

*(This question continues on the following page)*



0832



*(Question B1 continued)*

- (c) Explain how the circuit operates when the switch is opened. [3]

.....  
.....  
.....  
.....  
.....  
.....

- B2.** (a) Draw a block diagram in the box below to show how an open loop system works. [1]

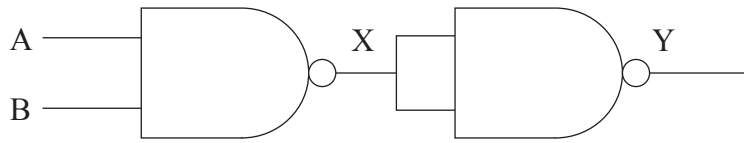
- (b) Describe the effect an open loop system would have on the function of a toaster. [2]

.....  
.....  
.....  
.....



B3. Figure B2 shows two NAND gates.

Figure B2: Two NAND gates



(a) Complete the truth table to show the outputs at X and Y.

[2]

A	B	X	Y
0	0		
0	1		
1	0		
1	1		

(b) Outline **one** reason why, in practice, digital logic functions would be implemented using NAND gates.

[2]

.....

.....

.....

.....







Please **do not** write on this page.

Answers written on this page  
will not be marked.



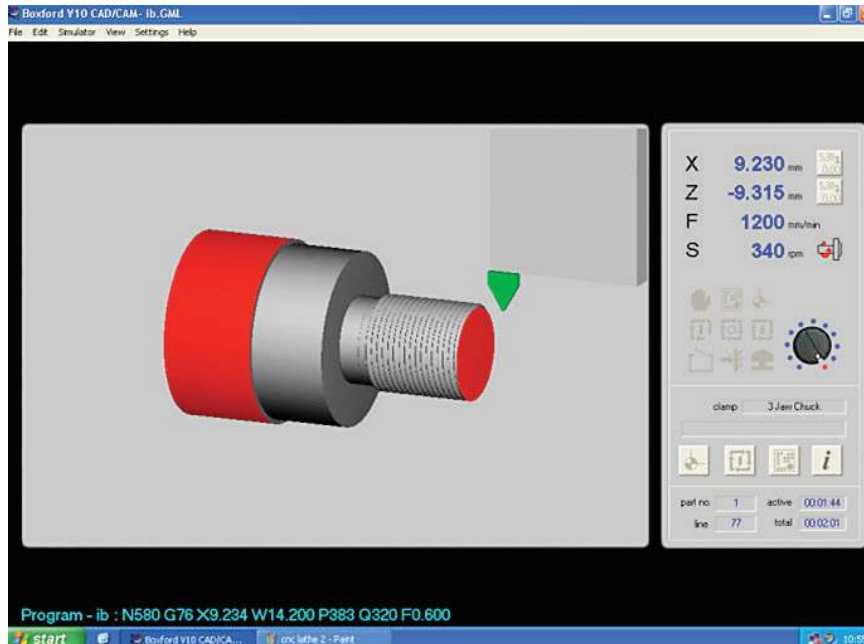
1332

Turn over

**Option C — CAD/CAM**

**C1.** **Figure C1** shows a 3D CAD image of a screw fitting made from a plastic, which has been input into a CNC machine.

**Figure C1: CAD image of a plastic screw fitting**



[Source: With the permission of Boxford.]

(a) State the type of the CNC machine used to manufacture the component in **Figure C1**. [1]

.....

.....

(b) Describe how a CNC machine would need to be reprogrammed if the component in **Figure C1** were made from metal instead of plastic. [2]

.....

.....

.....

.....

(This question continues on the following page)



1432

*(Question C1 continued)*

- (c) Explain why the component in **Figure C1** would require more than one tool for manufacture. [3]

.....

.....

.....

.....

.....

.....

- C2.** (a) State a wet rapid prototyping technique. [1]

.....

.....

- (b) Describe an advantage of using a wet rapid prototyping technique. [2]

.....

.....

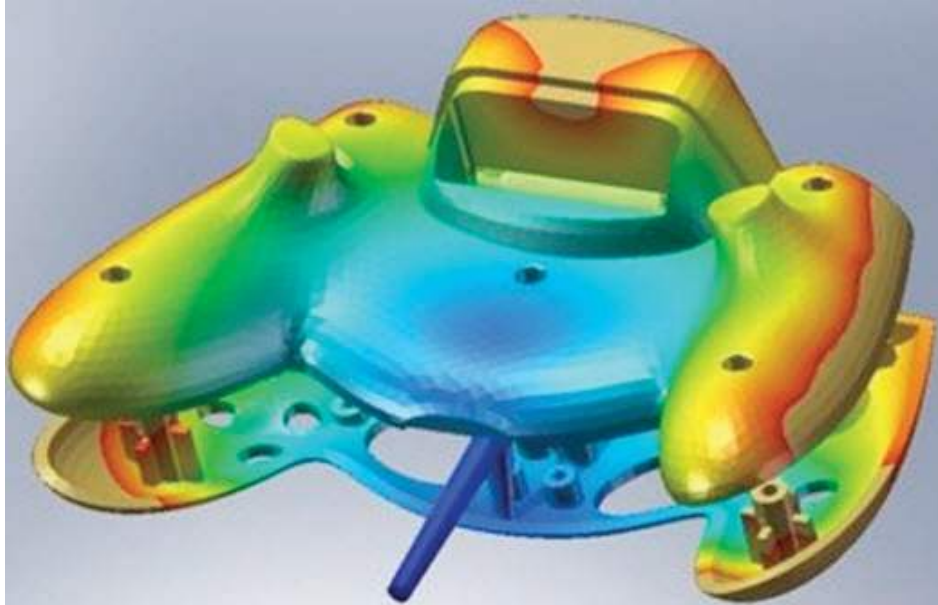
.....

.....



C3. **Figure C2** shows a mould flow simulation for injection moulding the plastic casing of an electronic product.

**Figure C2: Mould flow simulation for injection moulding the plastic casing of an electronic product**



[Source: <http://www.simpoe.com>. Used with permission.]

(a) Describe the purpose of the CAD mould flow simulation. [2]

.....

.....

.....

.....

(b) Outline **one** way in which CAD simulations can aid cost analysis in planning the manufacture of the plastic product. [2]

.....

.....

.....

.....





**C4.** Describe a four-axis CNC machining process.

[2]

.....

.....

.....

.....



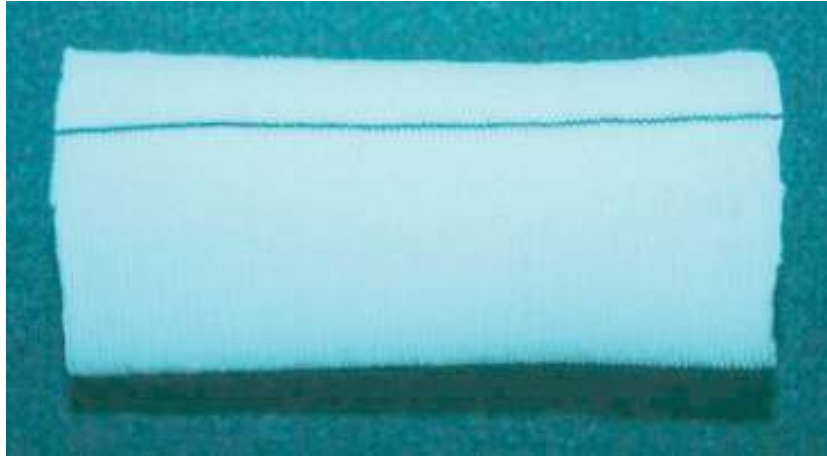




**Option D — Textiles**

**D1.** Figure D1 shows a woven polyester graft. It is often used in abdominal surgery.

**Figure D1: A woven polyester graft**



[Source: www.surgical-tutor.org.uk. Used with permission.]

(a) State **one** characteristic of polyester that makes it suitable for the graft apart from biocompatibility. [1]

.....

.....

(b) Outline **one** benefit of using a woven fabric for the graft. [2]

.....

.....

.....

.....

*(This question continues on the following page)*



*(Question D1 continued)*

- (c) Explain **one** reason why biocompatibility is important in the development of textile vascular grafts. [3]

.....

.....

.....

.....

.....

.....

- D2.** (a) State **one** benefit of producing yarn from mixed fibres. [1]

.....

.....

- (b) Outline **one** advantage of spinning wool fibres into yarn. [2]

.....

.....

.....

.....



**D3.** The first industrial knitting machines were designed to create flat knitted items (**Figure D2**). Later knitting machines were developed that would create circular knitted items (**Figure D3**).

**Figure D2: An industrial knitting machine for producing flat knitted items**



[Source: [http://en.wikipedia.org/wiki/File:Stocking\\_Frame.jpg](http://en.wikipedia.org/wiki/File:Stocking_Frame.jpg)[http://en.wikipedia.org/wiki/File:Stocking\\_Frame.jpg](http://en.wikipedia.org/wiki/File:Stocking_Frame.jpg)]

**Figure D3: An industrial knitting machine for producing circular knitted items**



[Source: [http://commons.wikimedia.org/wiki/File:Circular\\_knitting\\_machine.jpg](http://commons.wikimedia.org/wiki/File:Circular_knitting_machine.jpg)]

(a) Outline **one** benefit of the introduction of circular knitting machines for manufacturers. [2]

.....  
.....  
.....  
.....

(b) Outline **one** benefit of circular knitting machines for consumers. [2]

.....  
.....  
.....  
.....



**D4.** Outline **one** benefit of using CAM for embroidering clothes.

[2]

.....

.....

.....

.....

**D5.** Discuss **two** issues relating to the branding of textile products for adolescents.

[6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....







**Option E — Human factors design**

**E1.** Figure E1 shows a seven-point comfort rating scale.

**Figure E1: Seven-point comfort rating scale**

- 1 perfectly comfortable
- 2 quite comfortable
- 3 not very comfortable
- 4 uncomfortable
- 5 quite uncomfortable
- 6 very uncomfortable
- 7 extremely uncomfortable

(a) State the type of data scale represented by the comfort rating scale in **Figure E1**. [1]

.....

.....

(b) Outline **one** reason for using this type of data scale shown in **Figure E1**. [2]

.....

.....

.....

(c) Explain which point on the comfort rating scale would be appropriate for the design of public seating in a railway station as part of a policy of *Design for Discomfort*. [3]

.....

.....

.....

.....

.....

.....



**E2.** (a) Mass-produced clothing is produced in a limited range of sizes. State how designers allow for variations in human dimensions within a particular size. [1]

.....

.....

(b) Outline the percentile range used for shoe sizes for the mass market. [2]

.....

.....

.....



**E3.** **Figure E2** shows a door handle. **Figure E3** shows a door knob. Both products are manufactured from polished metal.

**Figure E2: Door handle**



[Source: [http://en.wikipedia.org/wiki/File:Door\\_Handle.JPG](http://en.wikipedia.org/wiki/File:Door_Handle.JPG)]

**Figure E3: Door knob**



[Source: [http://en.wikipedia.org/wiki/File:Gold\\_doorknob\\_crop.jpg](http://en.wikipedia.org/wiki/File:Gold_doorknob_crop.jpg)]

(a) Outline **one** advantage of the door handle in relation to human factors. [2]

.....

.....

.....

(b) Outline **one** advantage of the door knob in relation to human factors. [2]

.....

.....

.....



**E4.** Outline **one** disadvantage of using appearance prototypes at the design development stage. [2]

.....

.....

.....

.....



**E5.** **Figure E4** shows The Butterfly Stool designed by Sori Yanagi. The stool is manufactured from moulded plywood with brass fittings.

**Figure E4: The Butterfly Stool**

[Source: Please go to the link: <http://www.design-museum.de/de/sammlung/100-masterpieces/detailseiten/butterfly-yanagi.html>]

Discuss **two** human factor considerations in the design of The Butterfly Stool in **Figure E4**. [6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



Turn over



Please **do not** write on this page.

Answers written on this page  
will not be marked.



3132

Please **do not** write on this page.

Answers written on this page  
will not be marked.



3232