



22136206

**DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 3**

Friday 17 May 2013 (morning)

1 hour

Candidate session number

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Examination code

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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]

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

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

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(Question A1 continued)

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

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

[1]

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

[2]

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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]

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

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

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

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A6. Explain **three** implications of urbanization for the food industry in developed countries.

[9]

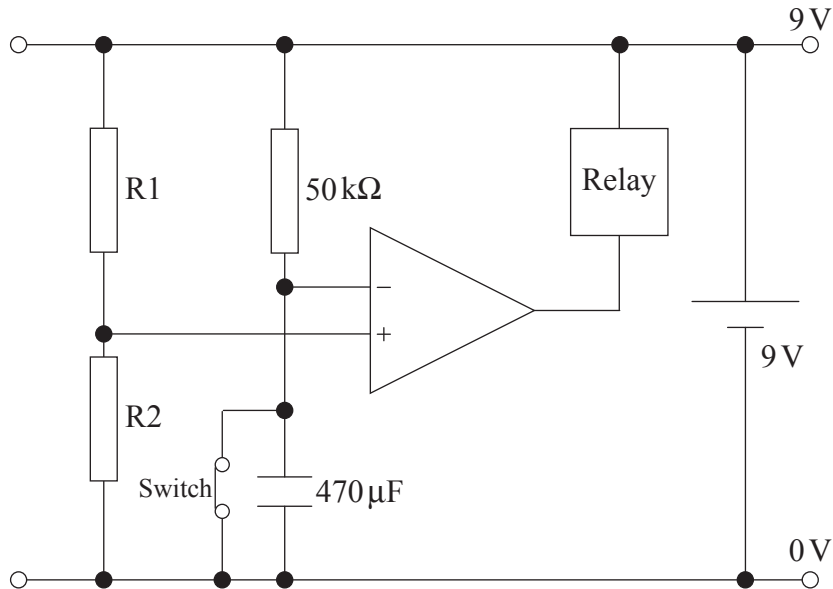
A large rectangular box with a black border, containing approximately 25 horizontal dotted lines for writing the answer to question A6.



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]

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

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(Question B1 continued)

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

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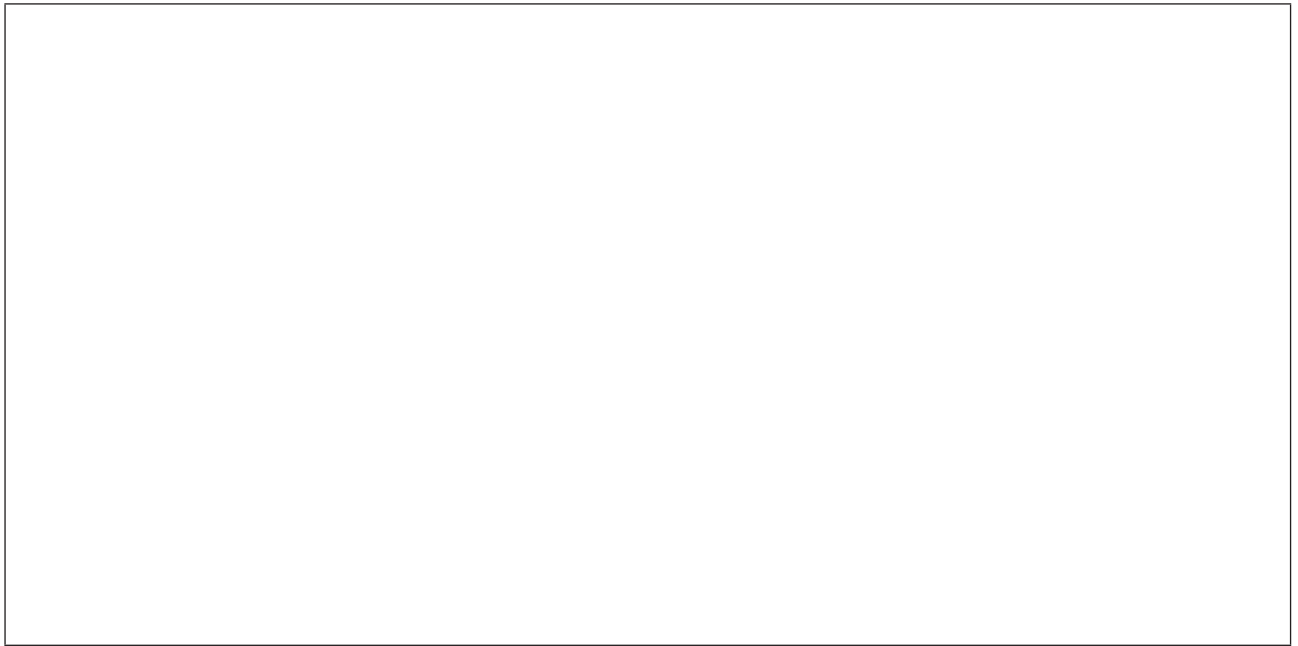
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- B2.** (a) Draw a block diagram in the box below to show how an open loop system works. [1]



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

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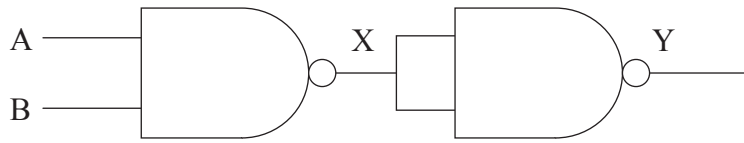
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B3. Figure B2 shows two NAND gates.

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]

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B4. List **two** key components of a digital hearing aid.

[2]

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B5. Compare bandwidth implications of time division multiplexing (TDM) with frequency division multiplexing (FDM) for the consumer.

[6]

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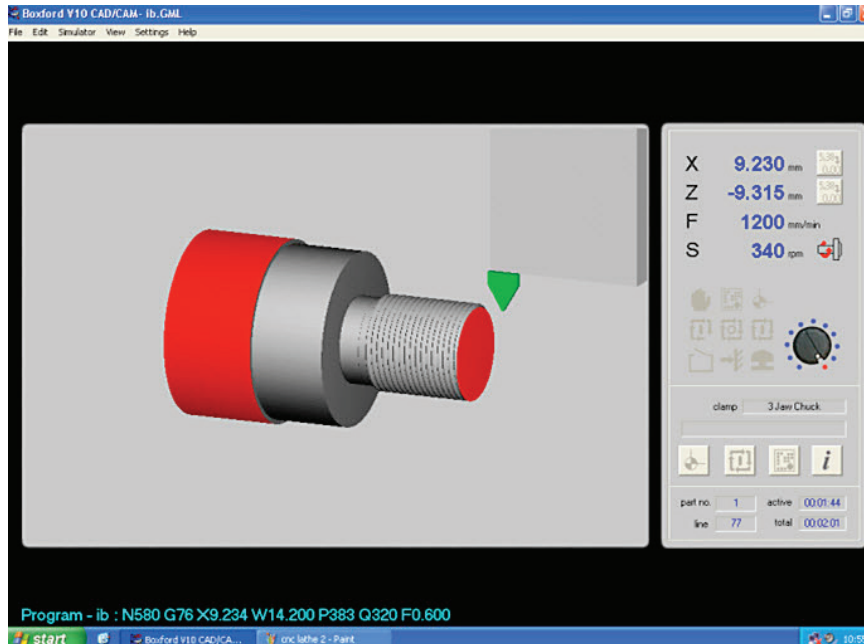
Answers written on this page
will not be marked.



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]

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(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]

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(Question C1 continued)

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

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

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

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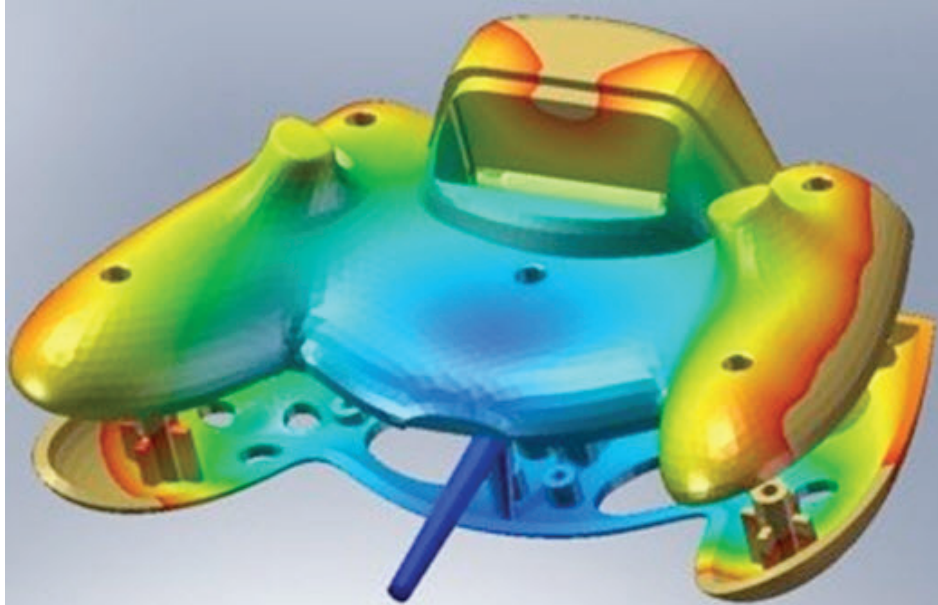
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C3. **Figure C2** shows a mould flow simulation for injection moulding the plastic casing of an electronic product.

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]

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

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C4. Describe a four-axis CNC machining process.

[2]

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C5. **Figure C3** shows a prototype design of a perfume bottle with its outer box.

Figure C3: Perfume bottle prototype and outer box



[Source: Designer: Erin Dameron, Brooklyn, New York]

Discuss **two** benefits of using rapid prototyping in the design development of the perfume bottle prototype shown in **Figure C3**.

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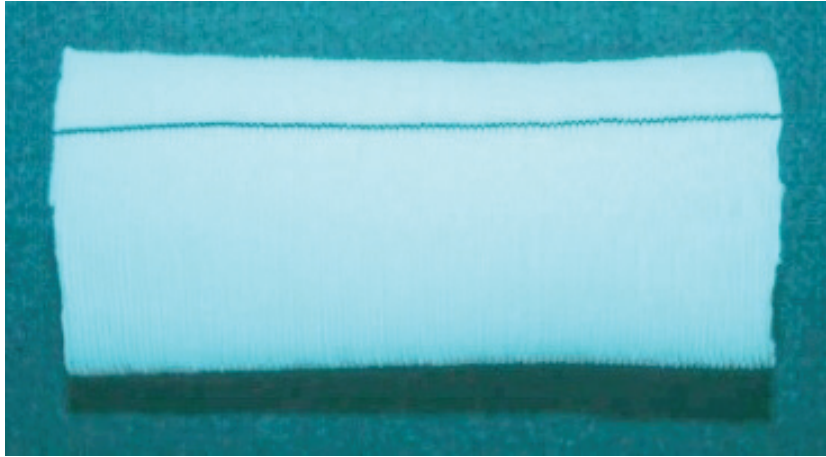
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Option D — Textiles

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]

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

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(Question D1 continued)

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

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

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

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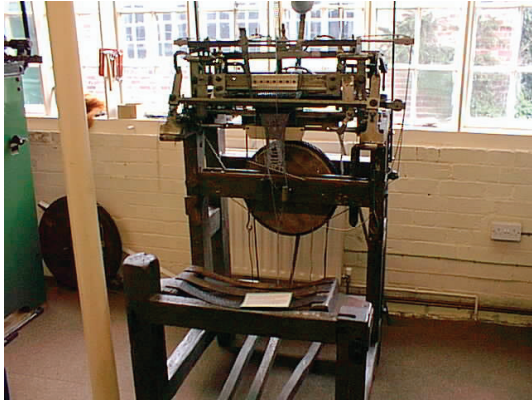
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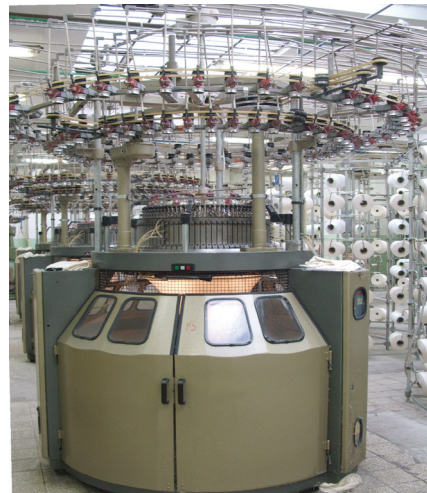
D3. The first industrial knitting machines were designed to create flat knitted items (**Figure D2**). Later knitting machines were developed that would create circular knitted items (**Figure D3**).

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



[Source: http://en.wikipedia.org/wiki/File:Stocking_Frame.jpghttp://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]

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

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

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

[2]

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

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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]

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

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(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]

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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]

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

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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]

Figure E3: Door knob



[Source: http://en.wikipedia.org/wiki/File:Gold_doorknob_crop.jpg]

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

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

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

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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]

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E6. Discuss **three** pieces of legislation which impact on human factors aspects of the design of an open-plan office.

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