

**DESIGN TECHNOLOGY  
HIGHER LEVEL  
PAPER 3**

Candidate number

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Thursday 15 May 2003 (morning)

1 hour 15 minutes

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**INSTRUCTIONS TO CANDIDATES**

- Write your candidate number in the box above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions from two of the Options in the spaces provided. You may continue your answers on answer sheets. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the letters of the Options answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.

**Option D – Food technology**

**D1.** Figure D1 shows a domestic bread-making machine, which enables the one-off production of a loaf of bread from a pre-packaged bread mix or from basic ingredients using a wide range of recipes. After putting the ingredients in the bread maker the bread maker kneads, proves and bakes the bread either immediately (which takes about three hours) or after a time delay, *e.g.* overnight.

**Figure D1**



(a) Outline how **one** lifestyle factor is likely to contribute to the popularity of the bread-maker as a domestic appliance. [2]

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(b) Outline the influence of scale of production on the organoleptic properties of bread produced in the bread-maker. [2]

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(c) Explain how the consumption of bread contributes to a balanced diet. [3]

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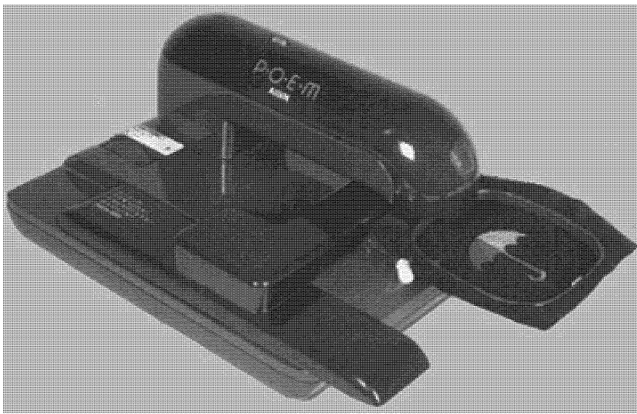
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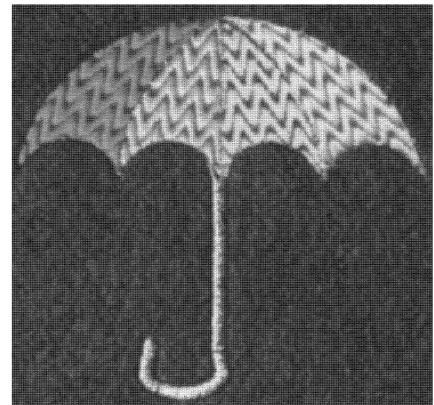
**Option E – Computer-aided design, manufacture and production**

**E1.** The embroidery machine shown in Figure E1 has been designed for use in schools as an introduction to computer-aided design. It can also be used for small businesses to produce results such as that shown in Figure E2. The embroidery machine interfaces with a personal computer running computer software. All the machine's operations are controlled through the computer. The machine is suitable for embroidering on a range of different fabrics, *e.g.* felt, denim and towelling. The fabric is held, while sewing, by a frame. The user just has to fit fabric into the frame, thread the machine with suitable colour yarns and use the computer to start sewing.

**Figure E1**



**Figure E2**



[Source: [www.home.clear.net.nz/pages/techsoft/](http://www.home.clear.net.nz/pages/techsoft/)]

(a) Outline how the embroidery machine would be interfaced to the personal computer to produce a CAD/CAM system. [2]

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(b) Outline how a scanner might be used with the CAD/CAM system. [2]

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(c) Suggest **one** reason why a frame is used to hold the fabric whilst being embroidered. [3]

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**E2.** Outline **one** advantage of Just-in-time (JIT) to manufacturing. [2]

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**E3.** Outline **one** impact of CAD/CAM on quality control. [2]

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**E4.** Discuss **three** strategies designers could deploy to achieve design for manufacture (DfM). [9]

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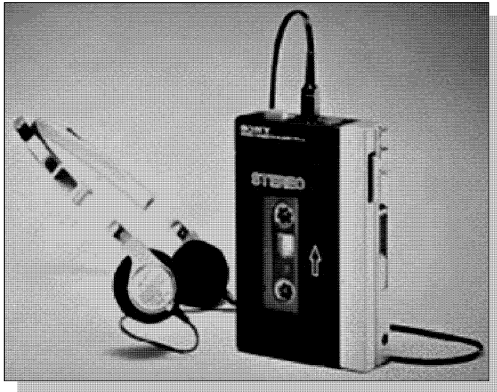
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**Option F – Invention, innovation and design**

**F1.** Figure F1 shows a Sony Walkman™ TPS-L2. According to Sony, “In 1979, an empire in personal portable entertainment was created with the ingenious foresight of Sony Founder and Chief Advisor, the late Masaru Ibuka, and Sony Founder and Honorary Chairman Akio Morita. It began with the invention of the first cassette Walkman TPS-L2 that forever changed the way consumers listen to music.” Figure F2 shows a portable CD player produced by Sony.

**Figure F1**



**Figure F2**



(a) Explain why the Sony Walkman™ shown in Figure F1 was an example of a pioneering innovation. [3]

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(b) Outline why the portable CD player shown in Figure F2 is an example of incremental design. [2]

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**F2.** Outline why Akio Morita can be regarded as a product champion. [2]

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**F3.** Outline the relevance of design to re-innovation. [2]

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**F4.** Outline the importance of science to innovation. [2]

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**F5.** Discuss **two** ways in which markets can be segmented. [9]

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**Option G – Health by design**

**G1.** Hearing aids come in a wide range of styles and sizes including completely-in-canal (CIC) (Figure G1), in-the-canal (ITC) (Figure G2), in-the-ear (ITE) (Figure G3) and behind-the-ear (BTE) (Figure G4).

**Figure G1**



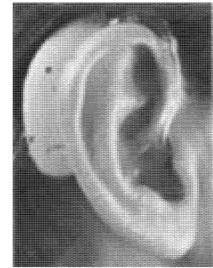
**Figure G2**



**Figure G3**



**Figure G4**



[Source: [www.audiology.org/consumer/guides/wyskahl](http://www.audiology.org/consumer/guides/wyskahl)]

(a) Outline why hearing aid shells are examples of one-off production. [2]

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(b) Identify **one** disadvantage of the BTE hearing aid shown in Figure G4. [2]

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(c) Explain how the size of the hearing aid and its position in the ear determines the hearing aid battery life and distortion. [3]

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**G2.** Outline the impact of improvements in material technology on the availability of contact lenses for a wider range of optical defects.

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**G3.** Outline the importance of vascular prostheses.

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**G4.** Explain the importance of clean fuels and improved stove design in reducing indoor air pollution and the implications for health.

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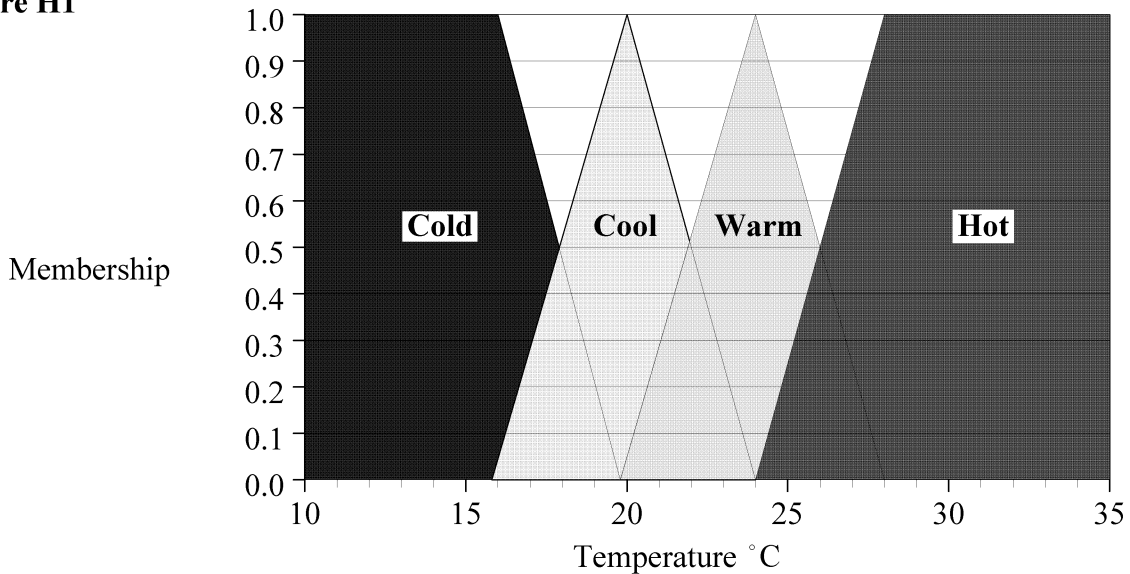
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**Option H – Electronic products**

**H1.** Fuzzy logic can be used provide precise control in a number of design applications, e.g. temperature control in a room. Figure H1 shows how temperatures from 10 to 35°C are assigned to membership of four temperature ranges labelled cold, cool, warm and hot. Crisp input values for temperature are translated into fuzzy truth values in the fuzzification step. IF-THEN rules, such as those shown below, are used to control the heater system.

**Figure H1**



- IF temperature is **cold** THEN heater is **high**
- IF temperature is **cool** THEN heater is **medium**
- IF temperature is **warm** THEN heater is **low**
- IF temperature is **hot** THEN heater is **zero**

- (a) Identify and draw the symbol for an electrical component that could be used to input a signal representing the room temperature into the fuzzy control system. [2]

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*(This question continues on the following page)*

*(Question H1 continued)*

(b) What fuzzy truth values would the input temperature of 22°C be translated into? [2]

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(c) Explain how the IF-THEN rules would be used to control the heating system. [3]

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**H2.** Outline the effect of adding impurities to a semiconductor material. [2]

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**H3.** Draw the symbol and show the truth table for an **AND** gate. [2]

**H4.** Discuss how multiple applications are programmed onto the same smart card and the benefits of this for users.

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