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DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 2

Candidate session number

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Monday 9 May 2011 (afternoon)

1 hour

Examination code

2	2	1	1	–	6	2	0	5

INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.

SECTION A

*Answer **all** questions. Write your answers in the boxes provided.*

1. Tube trains (underground/subway trains) (see **Figure 1**) are widely used as urban transport systems. A tube train typically comprises six to eight individual cars, each about 16 metres in length and 2.6 metres wide. Each car has five distinct sections (see **Figure 2**) separated by pairs of doors which open by sliding along the outside of the car (see **Figure 3**). The cars are regularly refurbished. **Figure 4** shows an older car with hanging handholds. **Figure 5** shows a refurbished car with a different design of handrails.

Figure 1: Tube train

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

Figure 2: Layout of one car

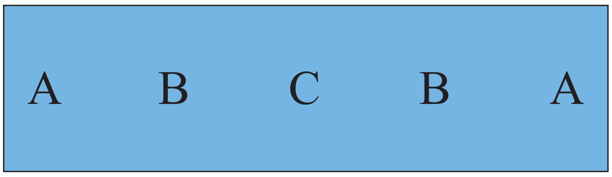
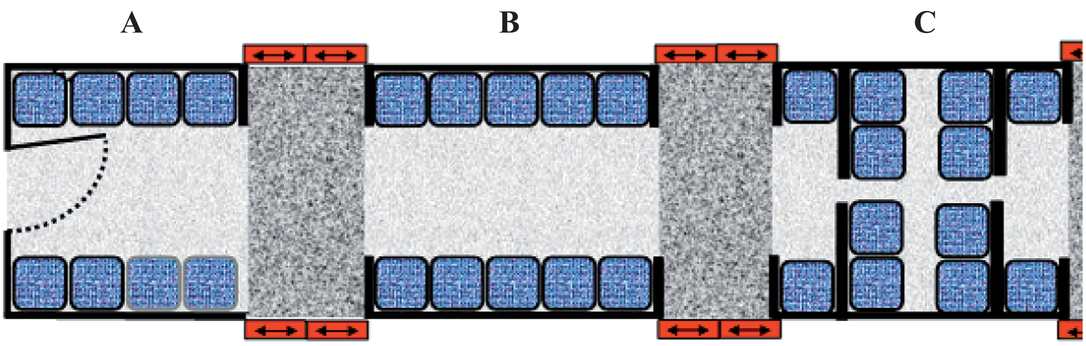


Figure 3: Partial view of layout of car shown in Figures 1 and 2



KEY: Fixed seat   Folding seat   Pair of sliding doors

Figure 4: Interior view of older car

Figure 5: Interior view of refurbished car

Source: www.trainweb.org/tubeprune. Used with permission.

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(Question 1 continued)

(a) (i) State the total number of pairs of sliding doors on each car. *[1]*

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(ii) State the total number of seated passengers which the car shown in Figure 1 and Figure 2 can carry. *[1]*

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(iii) Identify **one** advantage of the folding seats shown in section A of the car in Figure 3. *[2]*

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(Question 1 continued)

(b) (i) State **one** reason why bright colours are used for the handrails in Figure 5. *[1]*

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(ii) Explain how the tubular sections for the handrails shown in Figure 5 would have been produced. *[3]*

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(c) (i) Identify the adult percentile which would have been used to determine the height for the hanging handholds shown in Figure 4. *[2]*

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(ii) Outline **one** advantage of using the vertical handrail shown in Figure 5 over the hanging handholds shown in Figure 4. *[2]*

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2. **Figure 6** shows an expansion joint on a bridge.

Figure 6: Expansion joint on a bridge

[Source: http://durasystemscomputing.com/Fun/Pictures/DSC00061/ExpansionJointoftheFrenchTownBridge.JPG]

(a) Define *thermal expansion*. *[1]*

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(b) Explain **one** reason why the expansion joint shown in Figure 6 is an important consideration in the design of the bridge. *[3]*

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3. (a) Define *assembly-line production*. *[1]*

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(b) Explain the impact of assembly-line production on the workforce for a mechanized production process. *[3]*

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SECTION B

*Answer **one** question. Write your answers in the boxes provided.*

4. **Figure 7** and **Figure 8** show a Robin Day stackable chair manufactured by Hille. The original design was developed so that it was available in a range of seat heights and colours to make it suitable for use in schools. The chairs are made in two sections: the polypropene seat (which is injection moulded) and the legs (which are made from enamelled bent tubular steel).

Figure 7: Robin Day's stackable polypropene chair

Figure 8: Robin Day chairs stacked

[Source: www.costcuttersuk.com/hille_e_series_chair/hille _e_series_chair/153551_p.html]
Source: Supplied by Hille Furniture

(a) (i) List **two** advantages of using polypropene to make the seat of the chair. *[2]*

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(ii) Describe how production of the chair in a range of sizes is an example of product development. *[2]*

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(Question 4 continued)

(b) (i) Describe the concept of break-even in relation to the manufacture of the chair. *[2]*

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(ii) Explain how injection moulding contributes to cost-effectiveness for the chair manufacturer in relation to the manufacture of the chair in a range of sizes. *[3]*

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(Question 4 continued)

(c) (i) Identify how percentile range data for school children would contribute to the design of the different chair sizes. *[2]*

(ii) Explain how each of three design for manufacture (DfM) strategies (design for materials, design for process and design for assembly) are dominating constraints on the design of the chair. *[9]*

5. Airlines charge increasingly large penalties for overweight luggage. The penalties and the rules on penalties vary from airline to airline. The Balanzza Digital Luggage Scale (see **Figure 9**) has been designed to help avoid such penalties. The scale is designed to be compact ($13 \times 7 \times 2.5$ cm), lightweight (229 g) and cheap. A strong strap secures it to the bag. To weigh the bag it should be lifted by the scale, wait for the beep and then set down so the digital scale can be read (see **Figure 10** and **Figure 11**).

Figure 9: The Balanzza Digital Luggage Scale

Figure 10: Instructions for use

Figure 11: Scale in use

[Source: www.balanzza.co.uk]

(a) (i) Identify **one** target market for the Balanzza Digital Luggage Scale. *[2]*

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(Question 5 continued)

(ii) Explain why the price of the Balanzza Digital Luggage Scale would be a major constraint in the design brief. *[3]*

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(b) (i) Outline **one** difficulty the manufacturers of the Balanzza Digital Luggage Scale would have in getting their product to diffuse into the marketplace. *[2]*

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(ii) Outline **one** strategy involving the Internet that the manufacturers of the Balanzza Digital Luggage Scale could use to enhance market penetration. *[2]*

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(Question 5 continued)

(c) (i) List **two** ergonomic considerations which would inform the design of the Balanzza Digital Luggage Scale. *[2]*

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(ii) Discuss **three** evaluation activites (tests, models and experiments) that would be used to evaluate ideas for the Balanzza Digital Luggage Scale at the "developing the chosen solution" stage of the design cycle. *[9]*

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6. **Figure 12** shows the first transparent toaster to go into commercial production. It is called Le Toaster Vision and is manufactured by Magimix. A user can see when the toast is brown enough. Four infra-red heating tubes provide the heat to toast the bread. The transparent walls comprise two panels of double insulated glass.

Figure 12: Le Toaster Vision by Magimix.

www.magimix.com. Used with permission.

(a) (i) Outline **one** way in which constructive discontent might inform the development of Le Toaster Vision. *[2]*

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(Question 6 continued)

(ii) Explain the benefit of adopting a pioneering strategy for the Magimix company in relation to the production of the Le Toaster Vision. *[3]*

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(b) (i) Identify **one** physical property of glass, apart from its transparency, which makes it suitable for the walls of the Le Toaster Vision. *[2]*

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(ii) Outline **one** reason why design for disassembly is an important consideration for Le Toaster Vision. *[2]*

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(Question 6 continued)

(c) (i) Outline **one** way in which planned obsolescence would influence the design specification of Le Toaster Vision. *[2]*

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(ii) Discuss the criteria that a consumer might apply to evaluate Le Toaster Vision for value for money before purchase, during initial use and after long-term use. *[9]*

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

Answers written on this page will not be marked.