



88126202

**DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 2**

Friday 9 November 2012 (afternoon)

1 hour 45 minutes

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.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is [60 marks].



0124

SECTION A

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

1. Hong Kong International Airport (HKIA) designed by Norman Foster Associates has received many awards for its design and quality of facilities. It has a glass roof attached to a steel frame which is designed to flex with the wind. Most flights depart from Terminal 1. Terminal 2 is used as an overflow check-in area when the airport is at maximum capacity. There are no departure gates in Terminal 2. **Figure 1** shows an aerial view of the airport and **Figure 2** shows an initial sketch design. **Figure 3** shows part of the glass roof and **Table 1** and **Table 2** show operational data for the airport.

Figure 1: Aerial view of HKIA



Figure 2: Sketch design for HKIA

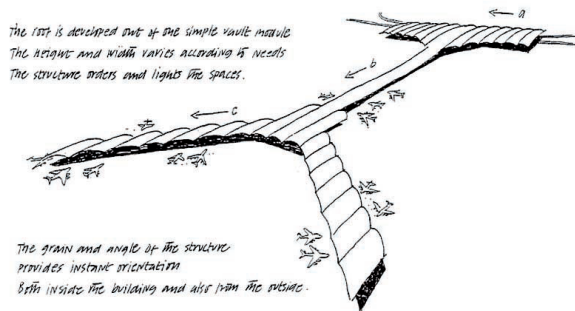


Figure 3: HKIA front view

Figure 3 removed for copyright reasons

[Source:
Figure 1: © Dennis Gilbert / VIEW
Figure 2: © Foster + Partners]

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(Question 1 continued)

Table 1 and Table 2: Operational data for Hong Kong International airport (2010)

Tables 1 and 2 removed for copyright reasons

- (a) (i) State the type of load exerted by the wind on the roof of the airport building. [1]

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- (ii) State the drawing technique used to create the sketch design in Figure 2. [1]

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(Question 1 continued)

- (iii) Outline the idea generating technique most likely used by the designer for the shape of the airport. [2]

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Questions 1 (b) (i) and (b) (ii) removed for copyright reasons

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(Question 1 continued)

Questions 1 (c) (i) and (c) (ii) removed for copyright reasons

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Turn over

(Question 1 continued)

Figures 4 and 5 and questions 1 (d) (i) and (d) (ii)
removed for copyright reasons

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(Question 1 continued)

Questions 1 (e) (i) and (e) (ii)
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2. (a) State the type of deformation a material undergoes beyond its yield point. [1]

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- (b) Explain the relationship between deflection and stiffness in structures. [3]

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3. (a) Describe *biofuel*. [2]

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- (b) Describe the function of *clean coal technology*. [2]

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4. (a) State the type of gear system used in a metal lathe mechanism. [1]

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- (b) Discuss belt and chain drive mechanical systems in relation to performance and cost. [3]

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5. (a) List **two** functions of the resin in the process of hand lay-up moulding. [2]

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- (b) Outline **one** benefit of using the technique of vacuum bagging in a composite lay-up process. [2]

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6. (a) Define *building envelope*.

[1]

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(b) Explain how the selection of different construction materials can contribute to the heat loss or gain from a building.

[3]

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SECTION B

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

- 7. **Figure 6** shows two coffee tables designed by John Green in the “Embrace” range. The tables can be used individually or fitted together to form a multi-purpose coffee table and storage unit. The tables are manufactured from plywood with a choice of three different surface veneers.

Figure 6: Embrace coffee tables



[Source: www.ariashop.co.uk/1288/embrace-table-by-john-green
Copyright ©John Green]

- (a) (i) Describe the structure of plywood. [2]

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(Question 7 continued)

- (ii) Outline **one** physical property required for the surface finish of the Embrace coffee table. [2]

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- (b) (i) Outline **one** reason for designing the coffee tables with a choice of surface finishes. [2]

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- (ii) Discuss **one** ergonomic consideration for the design of the handholds in the smaller version of the tables. [3]

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(Question 7 continued)

(c) (i) Outline the scale of production for the Embrace coffee tables.

[2]

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(ii) Explain **three** advantages of manufacturing the coffee tables with the technique of lamination.

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8. **Figure 7** shows the Dyson AM03 bladeless pedestal fan. It incorporates Air Multiplier™ Technology which multiplies the air that is drawn in from the surrounding environment by a factor of 15. In this way the Dyson fan generates smooth air flow. It has a fully variable speed, oscillates 90° and tilts through a range of 40°. It can extend from a minimum height of 1188 mm to a maximum of 1408 mm. **Figure 8** shows a conventional fan.

Figure 7: Dyson Bladeless fan



[Source: <http://www.dyson.com/fans/browse/therange.aspx?filters=table,tower,pedestal>. Used with permission.]

Figure 8: Conventional fan



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

- (a) (i) Outline why the Dyson fan has been designed to oscillate 90°.

[2]

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(Question 8 continued)

- (ii) Outline why the Dyson fan has been designed with a tilting mechanism. [2]

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- (b) (i) Outline **one** advantage of the Dyson fan operating with a smooth airflow. [2]

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- (ii) Explain the need for a large design team to develop the Dyson fan. [3]

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(Question 8 continued)

- (c) (i) Outline **one** way in which the Dyson fan has been designed to accommodate a wide percentile range. [2]

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- (ii) Suggest **three** advantages of the Dyson fan in Figure 7 compared to the conventional fan in Figure 8 in relation to ease of maintenance, safety and aesthetics. [9]

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9. **Figure 9** shows the Breville Radio-Toaster designed in a 1950s retro style. The radio has an illuminated digital display and a facility for 10 pre-programmed radio stations. The toaster has a variable browning function and a mid-cycle cancellation button. The toaster also has a reheat function so cooled toast can be reheated without burning and a defrost button which lengthens the toasting time for use with frozen bread. The Radio-Toaster costs approx £50 (75USD).

Figure 9 : Breville Radio-Toaster



[Source: www.geekalerts.com/breville-radio-toaster-radio/
Breville product used with the permission of Pulse Home Products Ltd.]

- (a) (i) Outline **one** reason why the toaster has a variable browning function. [2]

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(Question 9 continued)

- (ii) Outline **one** reason why the toaster has a mid-cycle cancellation button. [2]

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- (b) (i) Outline **one** disadvantage of the Radio-Toaster for the consumer. [2]

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- (ii) Explain **one** criteria consumers may use to evaluate the Radio-Toaster for value-for-money in relation to long-term use. [3]

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(Question 9 continued)

- (c) (i) Outline **one** reason why the Radio-Toaster may satisfy a green design policy. [2]

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- (ii) Discuss the Radio-Toaster in relation to invention, innovation and design. [9]

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