UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

DESIGN AND TECHNOLOGY 9705/03

Paper 3

October/November 2006

2 hours 30 minutes

Additional Materials: Answer booklet/Paper
A3 Drawing paper (5 sheets)
A range of design drawing equipment

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer any **two** questions from **one** of the Parts **A**, **B** or **C**.

Section B
Answer **one** question.

All dimensions are in millimetres.
The instruction 'discuss' denotes that you should:
- examine critically the issues raised by the question;
- explain and interpret these issues as appropriate;
- introduce evidence wherever possible to support conclusions of arguments.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **11** printed pages and **1** blank page.

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Section A

Answer **two** questions from **one** of the Parts **A, B** or **C.**

Part A – **Product Design**

1 Fig. 1 shows the design of a holder used to display ear rings.

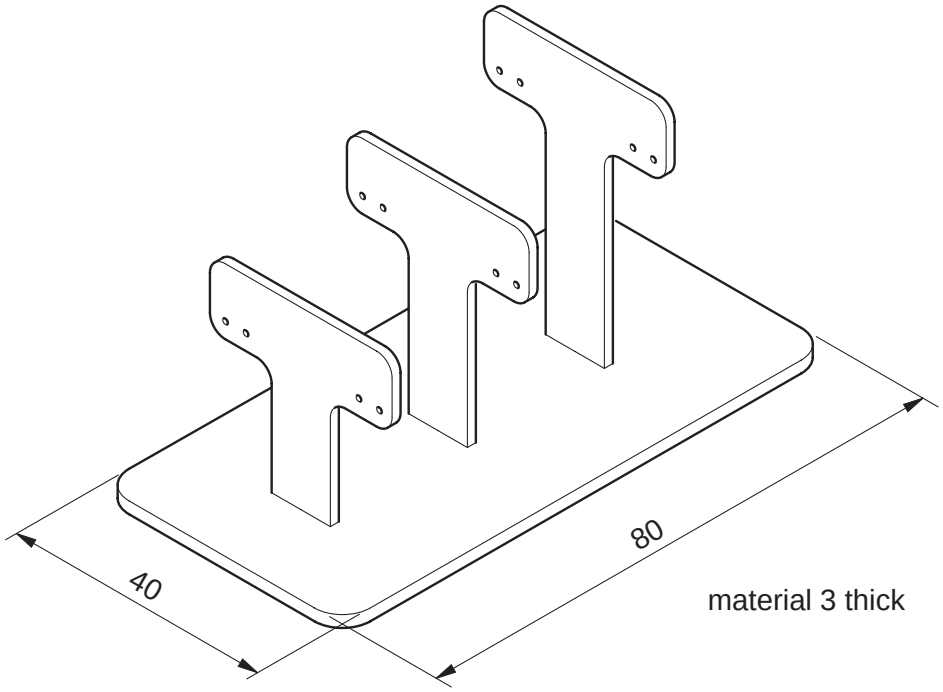

Fig. 1

(a) State a suitable material for the holder giving reasons for your choice. [3]

(b) Describe, using sketches and notes, how you would make the prototype holder. [8]

(c) Explain what changes may be necessary in the manufacturing method used and in the material selected if 10 000 holders were required.

Use notes and sketches to support your answer. [9]

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2 When selecting an appropriate surface finish for a product, a designer must consider:

- the material from which the product is made;
- visual / functional requirements;
- the environment in which the product is to be used.

Discuss how these factors are taken into consideration in the design of

either

a coffee table for an executive business suite

or

a mild steel ornamental garden gate. [20]

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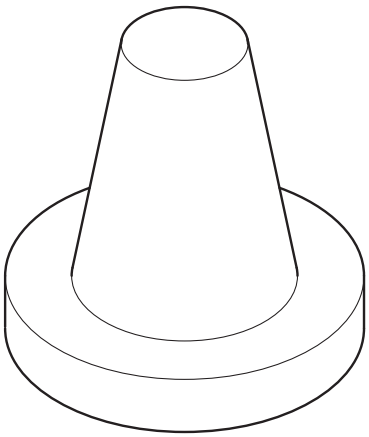
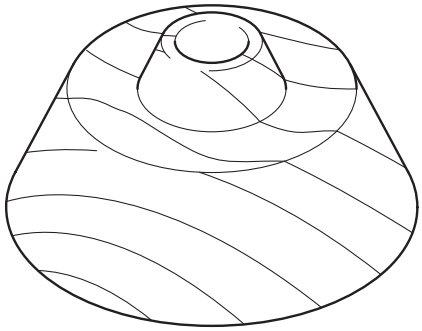
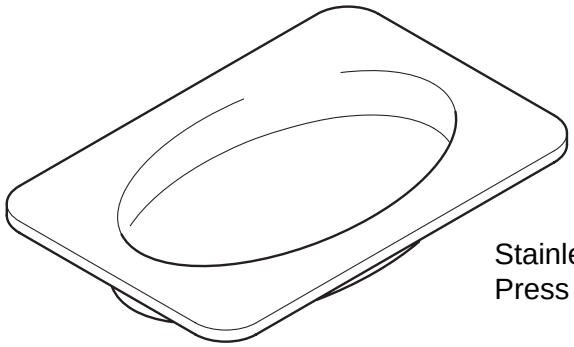


Polyethylene traffic cone
Rotationally moulded



Hardwood base for a sports trophy
Turned on lathe using a face plate



Stainless steel tray
Press formed

Fig. 2

Choose **two** of the items shown in Fig. 2 and for each:

(a) use notes and sketches to describe the manufacturing process that relates to the chosen item; [7 × 2]

(b) explain why the process is particularly suitable for the production of the item. [3 × 2]

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Part B – **Practical Technology**

4 **(a)** Use **one** example from **each** of the **three** classes of lever to explain how mechanical advantage is calculated. [9]

(b) Use **one** example to explain how energy efficiency is calculated. [3]

(c) **(i)** Use notes and sketches to explain how linear motion is achieved by using a pneumatic force. [5]

(ii) Identify a product that uses pneumatic force to create linear motion.

Describe why pneumatic force is appropriate in your chosen product. [3]

5 **(a)** Draw out and complete the table shown in Fig. 3 by selecting **four** materials from the list below.

Aluminium has been completed as an example.

Concrete **Timber** **Rubber** **Copper** **Lead** **Thermosetting plastic**

Material	Properties	Specific applications
aluminium	lightweight very good anti-corrosion properties can be alloyed to increase strength	cooking foil pans building cladding car components

Fig. 3 [12]

(b) Give **two** examples of new materials and explain how they have affected the design and manufacture of products. [8]

6 **(a)** The truth table for five logic gates, **V**, **W**, **X**, **Y** and **Z** are given below.

Draw the symbol and give the name for each gate. [10]

Inputs		Outputs				
		V	**W**	**X**	**Y**	**Z**
0	0	0	0	0	1	1
0	1	0	1	1	1	0
1	0	0	1	1	1	0
1	1	1	1	0	0	0

(b) Use **two** examples to explain the purpose and function of a digital – analogue converter. [10]

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Part C – **Graphic Products**

7 Fig. 4 shows orthographic views of a lectern.

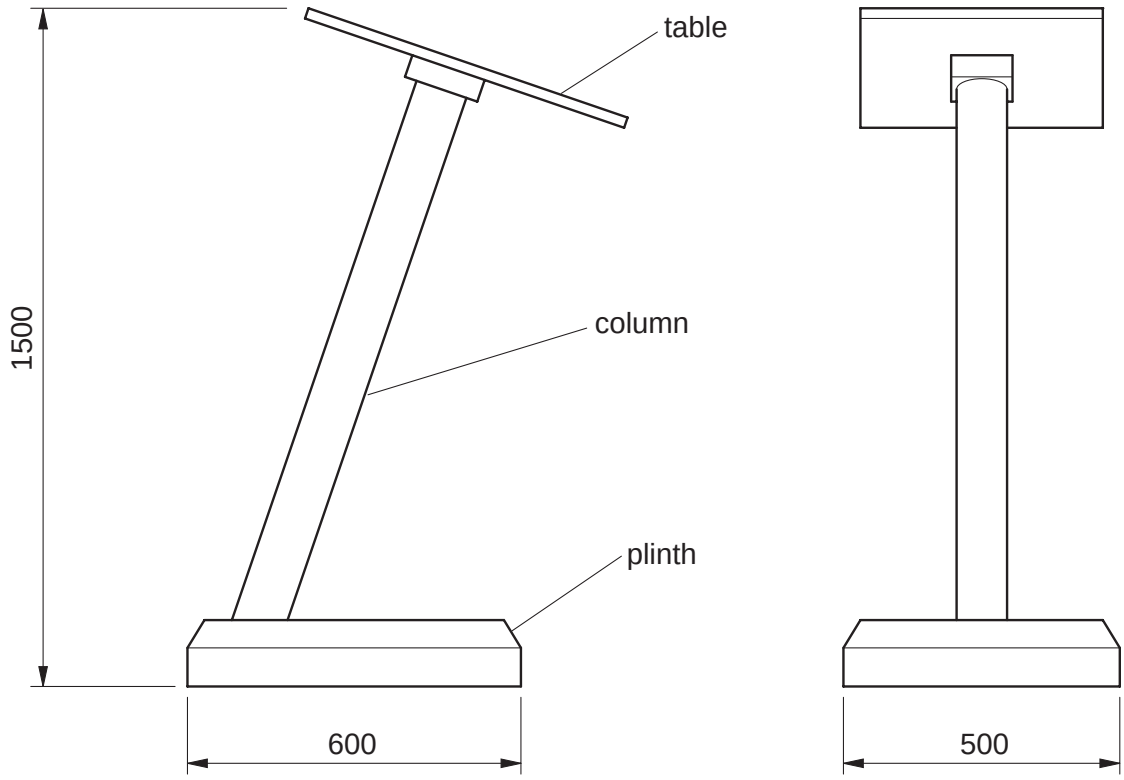

Fig. 4

(a) Produce, to a scale of approximately 1:10, a two point perspective presentation drawing of the lectern.

Select a view that gives maximum detail. [15]

(b) Render the drawing to show that the plinth and table are made of wood and that the column is made of polished steel. [5]

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8 Fig. 5 shows details of a model for a wastepaper bin.

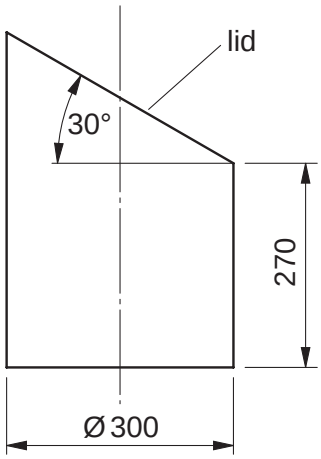

Fig. 5

(a) Draw, to an appropriate scale, a development (net) of the wastepaper bin.

Include the development of the top to show the true shape of the wastepaper bin lid. [10]

(b) A foot-operated pedal is to be included to enable the user to open the lid.

Use notes and sketches to show full details of a mechanism that could be used to open the lid when the pedal is depressed. [10]

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9 Fig. 6 shows a full size isometric view of a bracket.

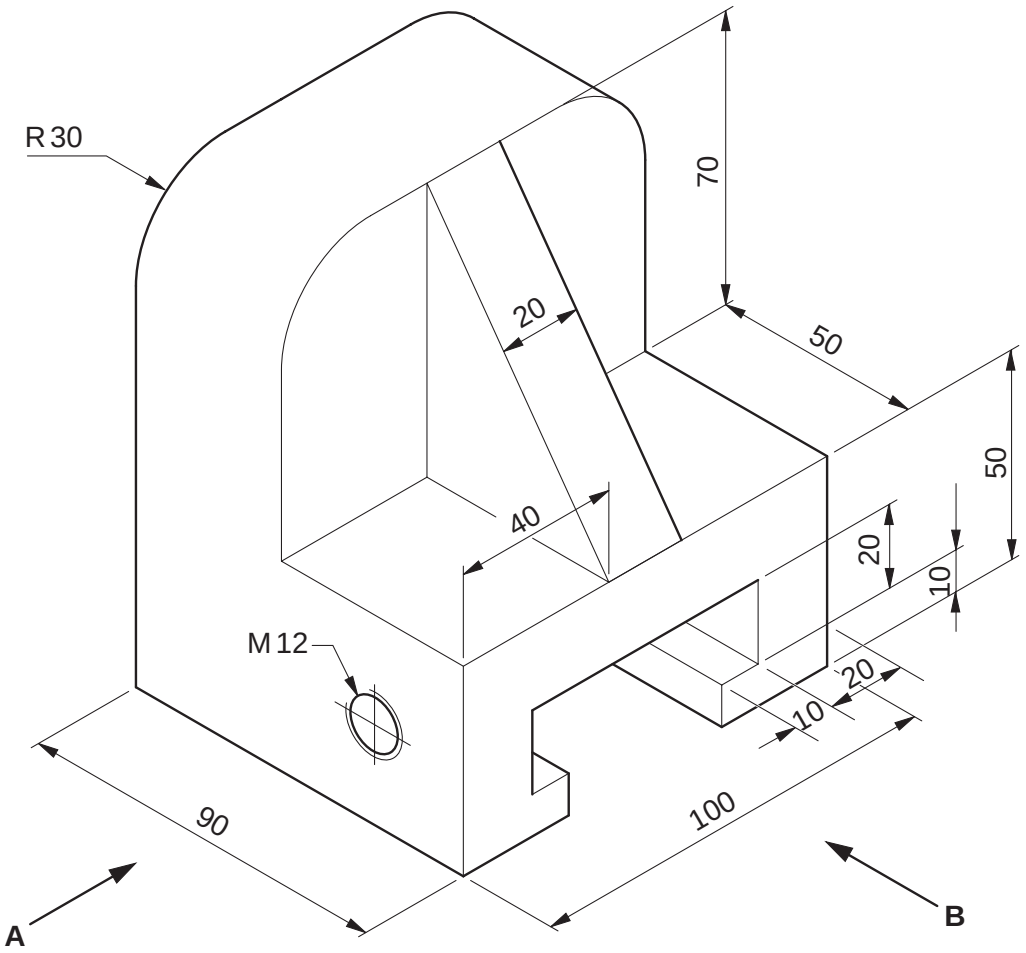

Fig. 6

(a) **(i)** Take measurements from Fig. 6 to draw views **A** and **B** to a scale of 2:1 in orthographic projection. Do not include hidden detail. Include the symbol to show the angle of projection. [7]

(ii) Fully dimension the drawings. [3]

(b) Designers use a range of graphical techniques to communicate ideas.

Give **one** example to describe each of the following:

- sectional drawing;
- exploded drawing.

Use notes and sketches to support your answer. [5 × 2]

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Section B

Answer **one** question on the A3 paper provided.

You should approach the design question of your choice in the following manner:

Analysis
Produce an analysis of the given situation/problem, which may be in written or graphical form. [5]

Specification
From the analysis produce a detailed written specification of the design requirements. [5]

Exploration
Use bold sketches and brief notes to show your exploration of ideas for a design solution, with reasons for selection. [25]

Development
Show, using bold sketches and notes, the development, reasoning and composition of ideas into a single design proposal. Give details of materials, constructional and other relevant technical details. [25]

Proposed solution
Produce drawings of an appropriate kind to show the complete solution. [15]

Evaluation
Give a written evaluation of the final design solution. [5]

[Total: 80]

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10 The caretaker at a local school often has to move chairs from rooms around the school to use in the main hall for music or drama productions.

Design a device that:

- can transport up to six chairs at a time;
- can be easily folded or disassembled for storage.

To assist you in your design work, dimensions of a chair are given in Fig. 7.

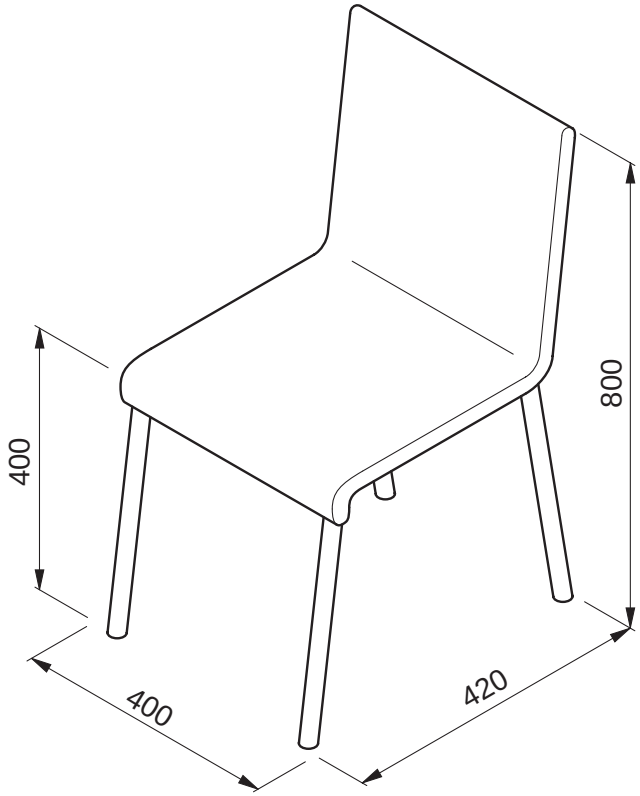

Fig. 7

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11 The teaching of mechanisms to students between the ages of 14 and 16 can be made more interesting and exciting by using working models to demonstrate the basic principles involved.

Design a working model to demonstrate the mechanical principles of **two** of the following:

- levers;
- linkages;
- cams;
- cranks.

The model must allow for a range of interchangeable parts to be used e.g. different cam profiles.

12 Sunrise Farm requires containers made from card to enable customers to pick their own tomatoes, have them weighed for payment and take them home.

Design a container that:

- is made from one A3 sheet of card;
- is easily assembled, without the need for adhesives, into a container with a carrying handle;
- includes graphics to help promote 'Sunrise Farm Products'.

Your proposed solution must include a development (net) of the container.

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