

## **MARK SCHEME for the October/November 2015 series**

### **9705 DESIGN AND TECHNOLOGY**

**9705/33**

Paper 3, maximum raw mark 120

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

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## Section A

### Part A – Product Design

#### 1 (a) description of process

- fully detailed 3–5
- some detail 0–2
- quality of sketches up to 2 7 × 2 [14]

#### (b) injection moulding

- accurate/well finished
- Large numbers produced
- Very quick production

#### drawing

- Easy to set up/simple operation
- consistent section
- consistent grain direction – strengthens wire

#### housing joint

- secure/strong joint
- easy to hand/batch produce
- joint looks good, no end grain/ neat lines

3 × 2 [6]

**[Total: 20]**

#### 2 (a) suitable material:

- appropriate hardwood
- aluminium
- stainless steel
- nylon/abs/polypropylene [1]

#### Reasons:

- can produce high quality finish
- comfortable to hold/grip
- easy to mould/press/shape
- can be frequently cleaned 2 × 1 [3]

#### (b) description to include: shaping/forming/pressing finishing

#### quality of description:

- fully detailed 3–7
- some detail 0–2

#### quality of sketches

up to 2 [9]

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(c) explanation could include:

- change in process
- change in materials
- use of jigs, formers, moulds
- simplification of design

quality of explanation:

- logical, structured
- limited detail

quality of sketches

4–6  
0–3  
up to 2 [8]

**[Total: 20]**

**3** Discussion could include:

- need for product
- marketing / advertising / promotions
- state of economy/fashion/trends
- target markets
- energy / profit mark-up and other costs

examination of issues

- wide range of relevant issues
- limited range

quality of explanation

- logical, structured
- limited detail

5–9  
0–4  
4–7  
0–3

supporting examples/evidence

- specific products
- specific promotion/advertising
- specific details of target market

4

**[Total: 20]**

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## Part B – Practical Design

- 4 (a) digital-to-analogue converter (DAC or D-to-A) converts a digital (usually binary) code to an analogue signal (current, voltage, or electric charge).

An analogue-to-digital converter (ADC) performs the reverse operation.

Signals are easily stored and transmitted in digital form, but a DAC is needed for the signal to be recognised by human senses or other non-digital systems.

Due to cost and the need for matched components, DACs are almost exclusively manufactured on integrated circuits (ICs).

The suitability of a particular DAC for an application is determined by a variety of measurements including speed and resolution.

A common use of digital-to-analogue converters is generation of audio signals from digital information in music players. Digital video signals are converted to analogue in televisions and mobile phones to display colours and shades. Digital-to-analogue conversion can degrade a signal, so conversion details are normally chosen so that the errors are negligible.

Full description of 2 or more of the above issues

3–4

Limited description

0–2 [4]

- (b) Input devices could be:

Graphics Tablets, Camera, Video Capture Hardware, Trackballs, Barcode reader, Joystick, Keyboard, Microphone, MIDI keyboard, Mouse, Scanner, Webcam, Electronic Whiteboard

Output device could be:

Monitor, Printers, Plotters, Projector, Speaker(s), CNC machines

For each example 1 mark

Function up to 2 marks

Benefit/use 1 mark

[4 × 4]

**[Total: 20]**

- 5 (a) R1 potentiometer [1] – sets level [1] and forms potential divider with R2 thermistor [1]  
 Temperature decreases – resistance of R2 increases Voltage at output [1] [4]

(b) (i) NOR gate [1]

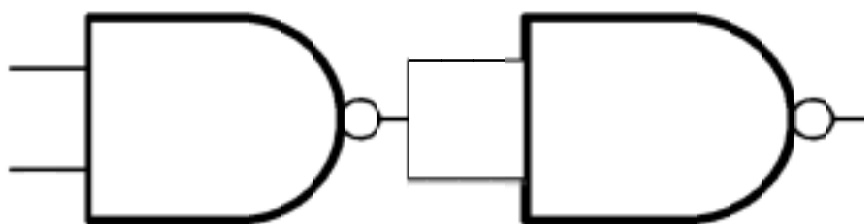
(ii)

| A | B | Output |
|---|---|--------|
| 0 | 0 | 1      |
| 0 | 1 | 0      |
| 1 | 0 | 0      |
| 1 | 1 | 0      |

All correct 2 marks  
2 or 3 lines of output correct 1 mark

[3]

(iii)



NAND symbol 1 mark correct configuration 1 mark

[2]

(c) discussion could include:

- wider range of products
- cheaper products
- quicker manufacture
- market competition

examination of issues

- wide range of relevant issues
- limited range

3–5  
0–2

quality of explanation

- logical, structured
- limited detail,

2–3  
0–1

supporting examples / evidence

- specific manufacturing/production advances
- specific materials advances
- specific products

2 [10]

**[Total: 20]**

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6 (a) frame – is a structure built up of parts (struts, ties) to withstand loads

Example: pylon, buildings, bridge, chair

Monocoque – is often a one piece structure that supports loads through its external skin

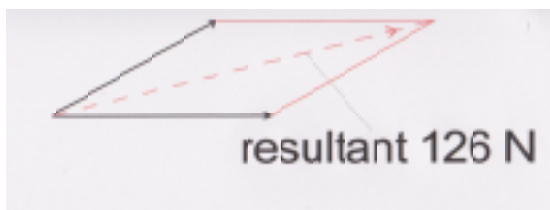
Example: pingpong/table-tennis ball, egg shell, car frame, aircraft fuselage

Description 2 marks

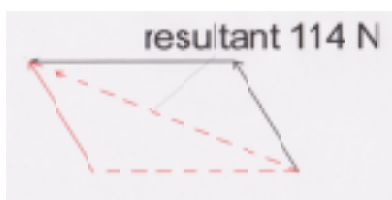
Example 1 mark

3 × 2 [6]

(b) (i)



(ii)



Direction 1 magnitude 1

2 × 2 [4]

(c) Discussion could include

- expansion/contraction
- degradation/increase fatigue
- strain gauge/micro testing
- safety implications

examination of issues

- wide range of relevant issues
- limited range

4–5

0–3

quality of explanation

- logical, structured
- limited detail,

2–3

0–1

supporting examples / evidence

- gaps/spacing
- tolerance on bridges/buildings

2 [10]

[Total: 20]

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### Part C – Graphic Products

|   |     |                                     |     |
|---|-----|-------------------------------------|-----|
| 7 | (a) | Correct shaft diameter              | [1] |
|   | (b) | In line wedge                       | [1] |
|   | (c) | Minimum distance                    | [1] |
|   | (d) | anti clockwise                      | [1] |
|   | (e) | 0°–90° simple harmonic motion rise  | [4] |
|   | (f) | 90°–150° dwell                      | [1] |
|   | (g) | 150°–330° uniform                   | [3] |
|   | (h) | 330°–360° dwell                     | [1] |
|   |     | displacement diagram                | [5] |
|   |     | quality of communication / accuracy | [2] |

**[Total: 20]**

### 8 batch of 10 A3 colour Health and safety posters

#### (a) (i) Appropriate technique (screen print, digital – CAD – photocopier)

quality of description:

– fully detailed

3–5

– some detail

0–2

quality of sketches

up to 2 [7]

batch of 5 000 full colour 16 page A4 school prospectus

#### (ii) Appropriate technique (offset litho)

quality of description:

– fully detailed

3–5

– some detail,

0–2

quality of sketches

up to 2 [7]

#### (b) Contrast and comparison

Detailed, cost and quality covered

5–6

Some detail, at least cost or quality covered,  
some comparisons drawn

3–4

Limited detail, brief statements

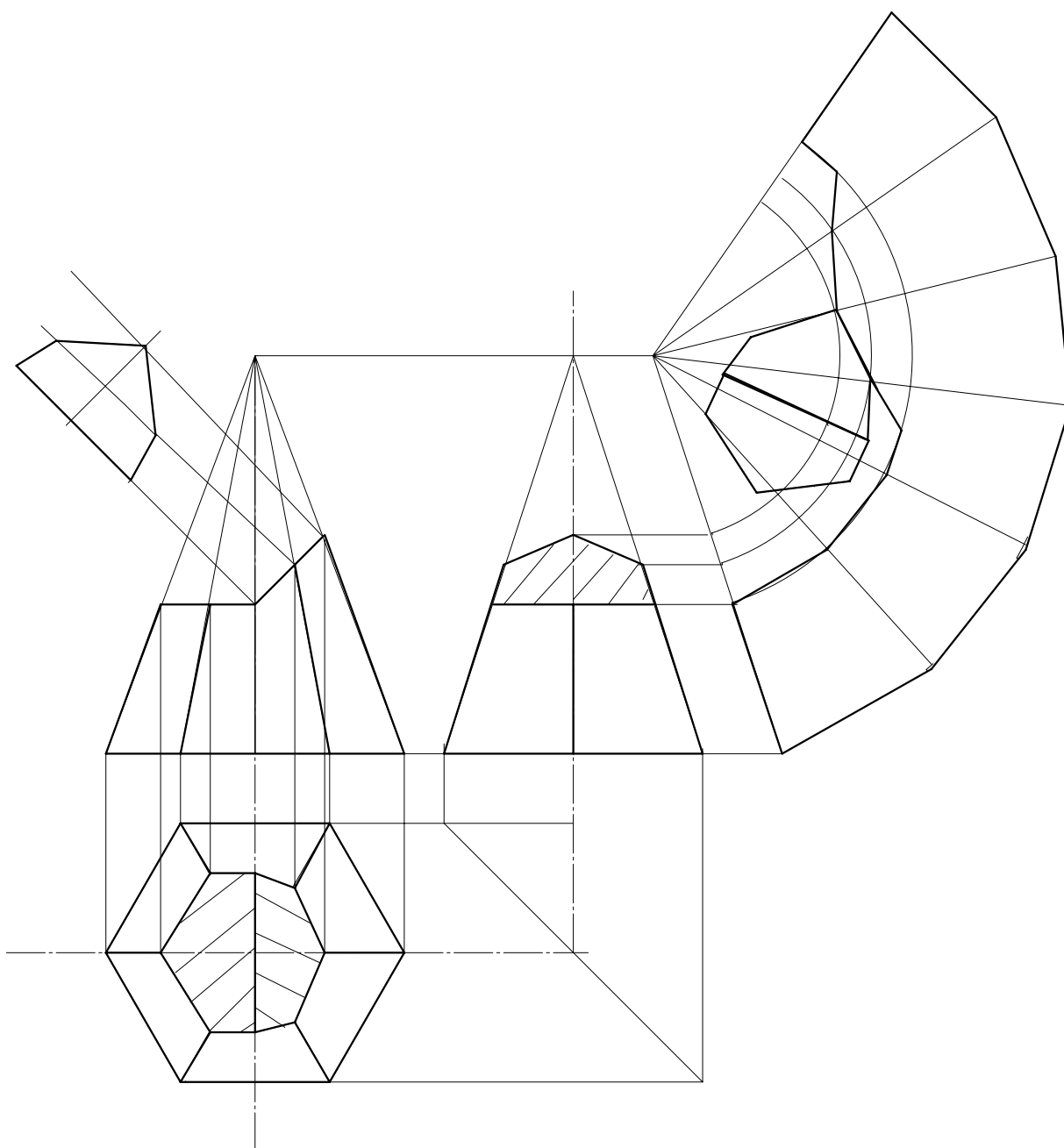
0–2 [6]

**[Total: 20]**

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- 9 (a) correct given elevation 1  
Plan 3  
End elevation 4 [8]
- (b) fully correct development, side (base) 4  
seat development 2 [6]
- (c) appropriate construction up to 4  
clarity of sketches 2 [6]

[Total: 20]





|               |  |                 |              |
|---------------|--|-----------------|--------------|
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## Section B

### Analysis

Analysis of the given situation/problem. [0–5]

### Specification

Detailed written specification of the design requirements.  
At least five specification points other than those given in the question. [0–5]

### Exploration

Bold sketches and brief notes to show exploration of ideas for a design solution, with reasons for selection.

- range of ideas [0–5]
- annotation related to specification [0–5]
- marketability, innovation [0–5]
- evaluation of ideas, selection leading to development [0–5]
- communication [0–5]

### Development

Bold sketches and notes showing the development, reasoning and composition of ideas into a single design proposal. Details of materials, constructional and other relevant technical details.

- developments [0–5]
- reasoning [0–5]
- materials [0–3]
- constructional detail [0–7]
- communication [0–5]

### Proposed solution

Produce drawing/s of an appropriate kind to show the complete solution.

- proposed solution [0–10]
- details/dimensions [0–5]

### Evaluation

Written evaluation of the final design solution. [0–5]

**[Total: 80]**