



Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE ENGINEERING

Unit 3 Written Paper

Monday 6 June 2016

Afternoon

Time allowed: 1 hour

Materials

For this paper you must have:

- normal writing and drawing instruments.

Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in the answer book. Cross through any work you do not want to be marked.
- All dimensions given in millimetres unless otherwise stated.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.
- You are reminded of the need for good English and clear presentation in your answers. Quality of Written Communication will be assessed in Question 7 (a).



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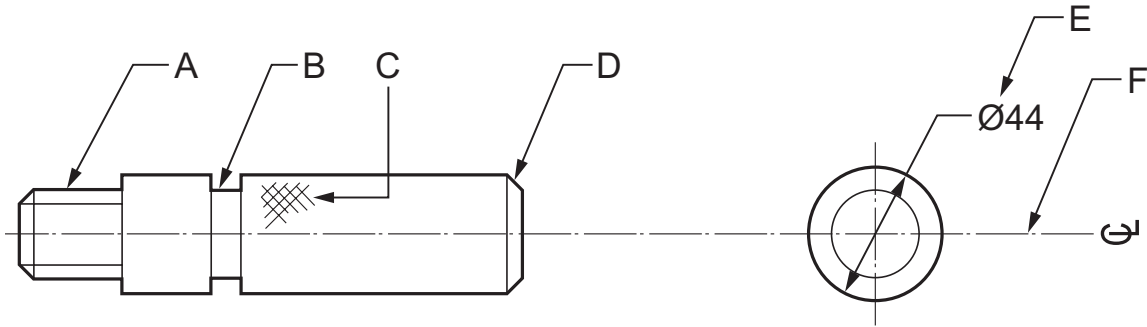
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Answer **all** questions in the spaces provided.

1 Engineering drawings use different ways of conveying information about components.

Figure 1



1 (a) Name the features shown in **Figure 1**. [4 marks]

- A _____
- B _____
- C _____
- D _____

1 (b) Name the symbols shown in **Figure 1**. [2 marks]

- E _____
- F _____

1 (c) Explain why symbols and abbreviations are used on engineering drawings. [2 marks]



2 **Figure 2** shows an isometric view of an MP3 player.

Figure 2

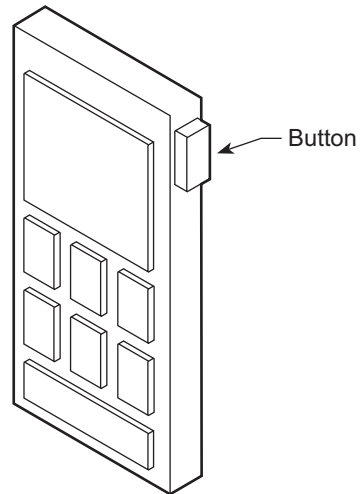
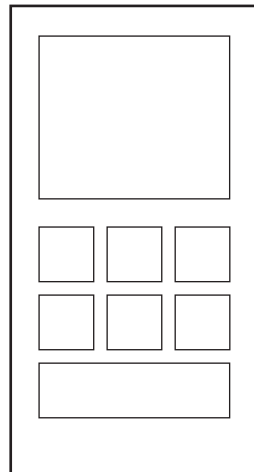


Figure 3 shows a third angle orthographic projection of the same MP3 player.

Figure 3



2 (a) Complete **Figure 3** to include the following:

2 (a) (i) the missing elevation

[3 marks]

2 (a) (ii) the side button.

[2 marks]

Turn over ►



2 (b) The MP3 player shown in **Figure 2** is to be rendered.

Describe how the drawing could be rendered to make it more realistic.

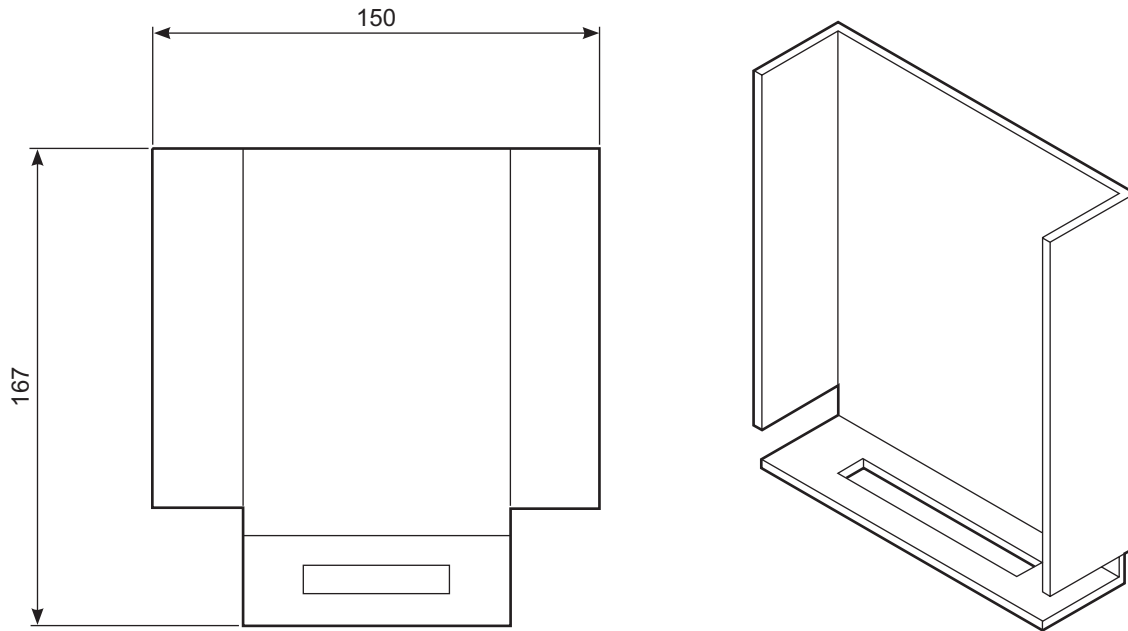
[3 marks]

8



- 3 The drawings in **Figure 4** show a protective casing for a music player.

Figure 4



All dimensions in mm

- 3 (a) The component shown in **Figure 4** is to be cut from a sheet size of 350 mm x 650 mm.

Calculate how many pieces can be cut from the sheet to keep the waste material to a minimum.

Use the space below to show your calculations.

[4 marks]

Number of components per sheet _____

Turn over ►



3 (b) The protective casing will be manufactured using an automated process.

3 (b) (i) Explain **one** advantage to the manufacturer of using an automated process.

[2 marks]

3 (b) (ii) Explain **one** disadvantage to the manufacturer of using an automated process.

[2 marks]

8

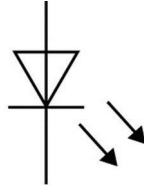


4 (a) Add the following component symbols to the given light sensor circuit diagram.

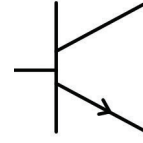
[5 marks]



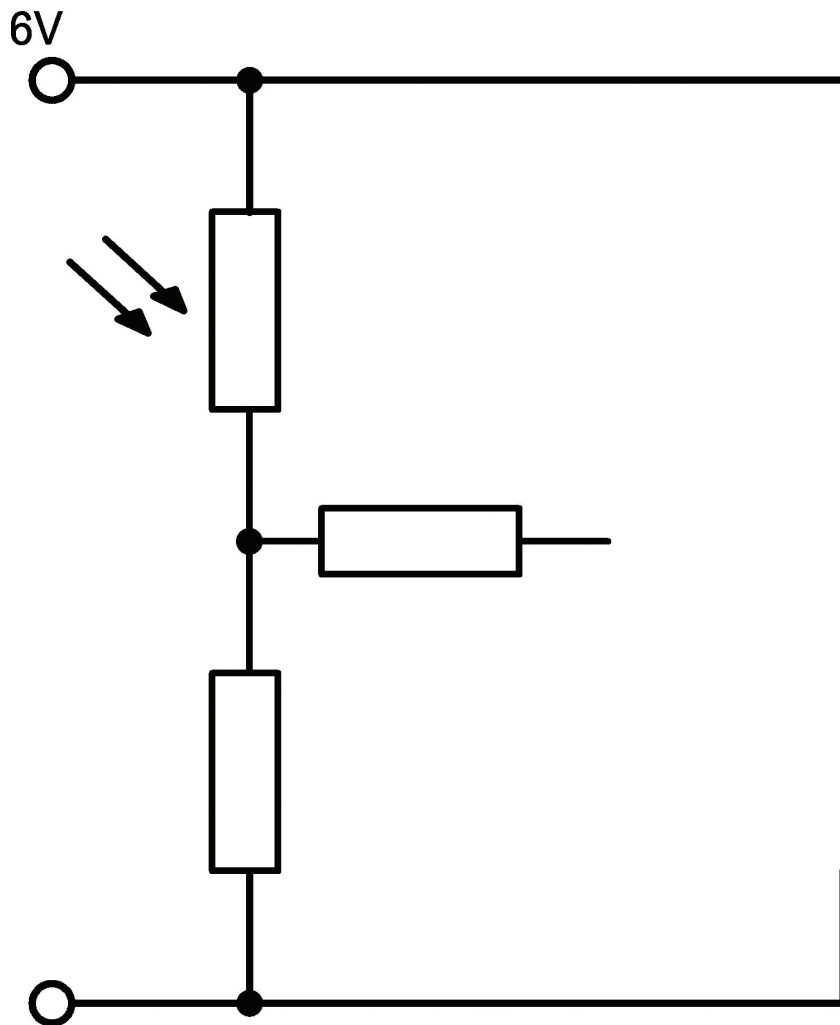
Component 1 = Resistor



Component 2 = LED



Component 3 = Transistor

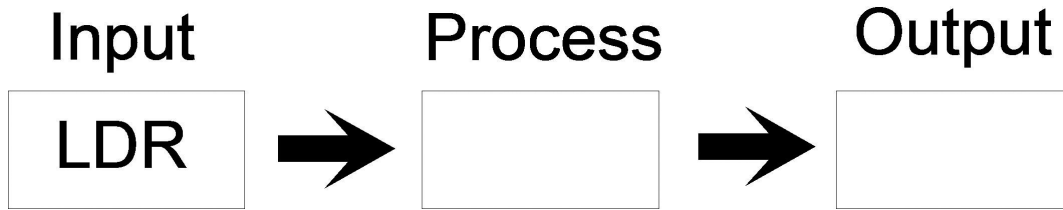


Turn over ►



4 (b) On the control system diagram below, identify the process and output components of the light sensor circuit. The input has been completed for you.

[2 marks]



4 (c) Describe how the light sensor circuit can be used to save energy.

Give **one** suitable application.

[3 marks]

10



- 5 The electrical socket plate shown in **Figure 5** is to be made from low carbon (mild) steel.

Figure 5



- 5 (a) Give **two** reasons why low carbon (mild) steel has been chosen for making the electrical socket plate in **Figure 5**.

[4 marks]

Reason 1 _____

Reason 2 _____

- 5 (b) The low carbon (mild) steel electrical socket plate requires a surface finish to protect it from corrosion.

Name **one** suitable industrial process that would protect against corrosion.

Do not include painting in your answer.

[1 mark]

Turn over ►



5 (c) Name **two** health and safety hazards associated with the process you have named in part (b).

[2 marks]

Hazard 1 _____

Hazard 2 _____

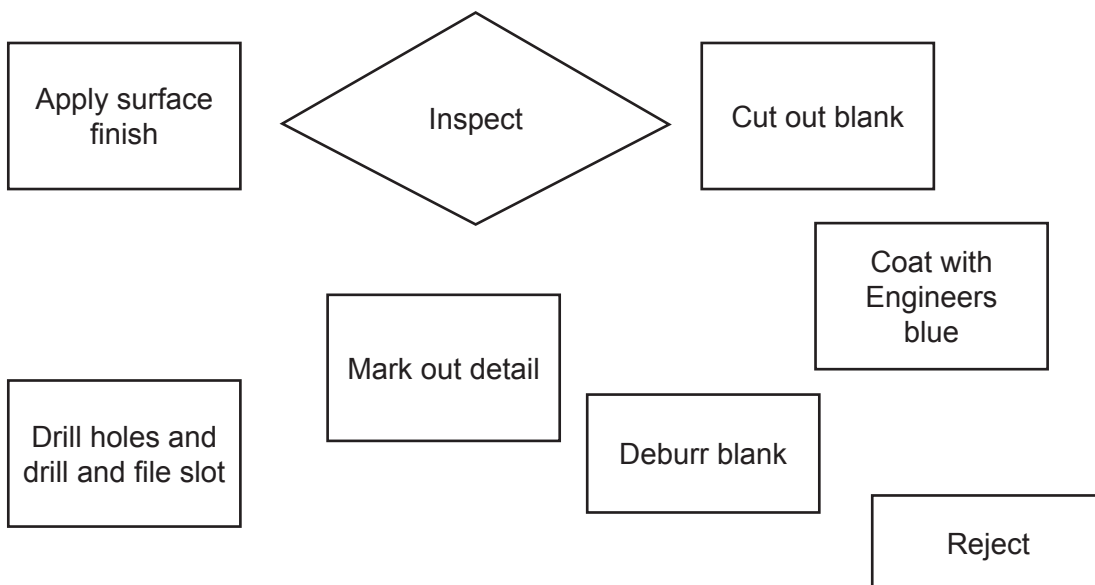
5 (d) Explain why the manufacturer does not use paint to prevent corrosion on the electrical socket plate.

[3 marks]

5 (e) Before the electrical socket plate shown in **Figure 5** goes into production, a skilled craftsman makes a prototype.

Produce a manufacture flow chart on the opposite page using the shapes below.

[7 marks]



START

FINISH

5 (f) Complete the flow chart by adding a feedback loop.

[2 marks]

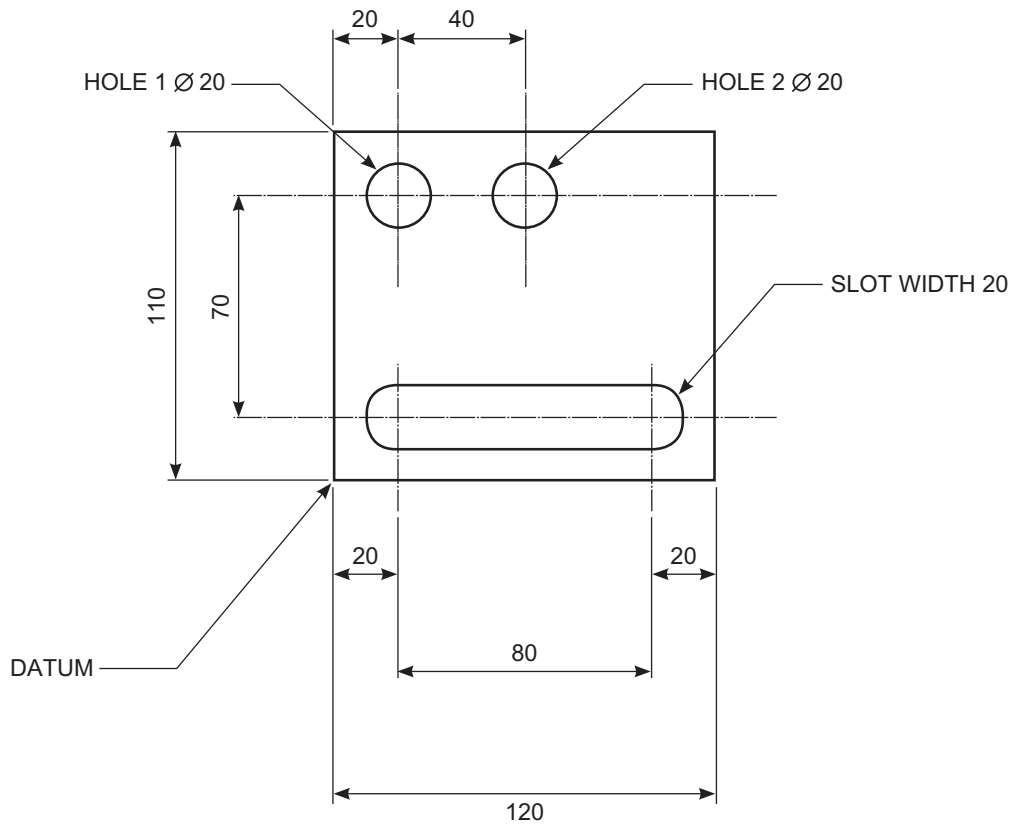
19

Turn over ►



6 The bracket in **Figure 6** is to be made using a Computer Numerically Controlled (CNC) milling machine.

Figure 6



Material thickness 6 mm

Complete the table below to show the absolute co-ordinates for a 20 mm cutter to start and finish the machining of the slot and holes.

[7 marks]

Operation	X co-ordinate	Y co-ordinate	Z co-ordinate
Move to start of slot	20	20	10
Plunge to depth	20	20	-7
Move to end of slot			-7
Exit slot	100	20	
Move to start of hole 1	20		10
Drill hole 1	20	90	
Exit hole 1	20	90	10
Move to start of hole 2		90	

7



7 (a) The frame of a road racing bicycle is made from a composite material.

Discuss the advantages and disadvantages of using a composite material instead of metals for the manufacture of the bike frame.

Quality of Written Communication will be assessed in this question.

[6 marks]

Question 7 continues on the next page

Turn over ►



7 (b) Name a smart material that can be used to make the bicycle easier to see in the dark. **[1 mark]**

7 (c) Explain how the working properties of the smart material you have named in part (b) will make the bicycle easier to see in the dark. **[3 marks]**

10



There are no questions printed on this page

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