OCR
Oxford Cambridge and RSA

Thursday 18 May 2017 – Afternoon

LEVEL 1/2 CAMBRIDGE NATIONAL IN ENGINEERING MANUFACTURE

R109/01 Engineering materials, processes and production

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
None

Duration: 1 hour

R109/01

6697215174

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The total number of marks for this paper is **60**.
- The number of marks for each question is given in brackets **[ ]** at the end of each question or part question.
- Dimensions are in millimetres unless stated otherwise.
- Your quality of written communication will be assessed in questions marked with an asterisk (*****).
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 A list of engineering materials is given below.

ABS	**Cast iron**	**Polyester resin**
Brass	**GRP**	**Stainless steel**
Bronze	**High Speed Steel**	**Urea-formaldehyde**
Carbon fibre	**HIPS**	**Zinc**

(a) Complete the following statements by adding materials from the list.

(i) ..... and ..... are ferrous metals. **[2]**

(ii) ..... and ..... are composite materials. **[2]**

(iii) ..... is a thermosetting plastic. **[1]**

(iv) ..... and ..... are non-ferrous alloys. **[2]**

(b) Give **three** reasons why a thermoplastic material might be used for a product rather than a metal.

1 .....

.....

2 .....

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3 .....

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[3]

2 **(a)** **(i)** Give **two** properties of copper that make it particularly suitable for the wires in electric cables.

1 .....

2 .....
[2]

(ii) Explain why copper is not used in overhead power transmission cables.

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..... **[3]**

(b) Engineering materials are normally supplied in solid form.
Name **two** other forms of supply for engineering materials.

1 .....

2 .....
[2]

(c) Explain, using **one** example, what is meant by the term 'non-destructive testing' (NDT).

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..... **[3]**

3 Fig. 1 shows a support bracket made in two parts.
Both parts are made from 3 mm thick mild steel.

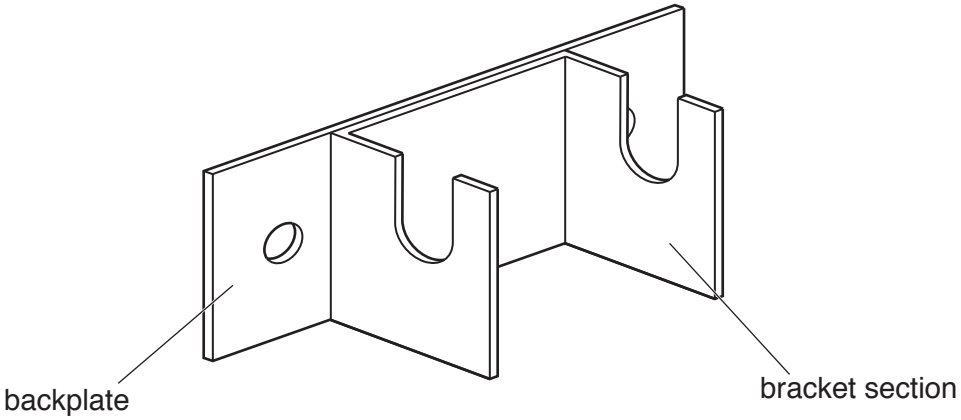

Fig. 1

(a) The bracket section is joined to the backplate by brazing.

Complete the table below by giving the stages needed to braze the two parts together.
The first and last stages have been done for you.

	Process
Stage 1	Clean the surface of both parts where the joint is going to be
Stage 2	
Stage 3	
Stage 4	
Stage 5	
Stage 6	
Stage 7	Remove scale and excess braze where necessary and clean finished piece

[5]

(b) (i) Give **two** methods of joining the bracket section to the backplate without using heat.

1 .....

2 .....
[2]

(ii) Choose **one** of the methods you have given in part **(i)** and describe how it would be used to join the bracket section to the backplate.

Method .....

Description .....

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..... **[3]**

4 Fig. 2 shows a locating peg made from mild steel.

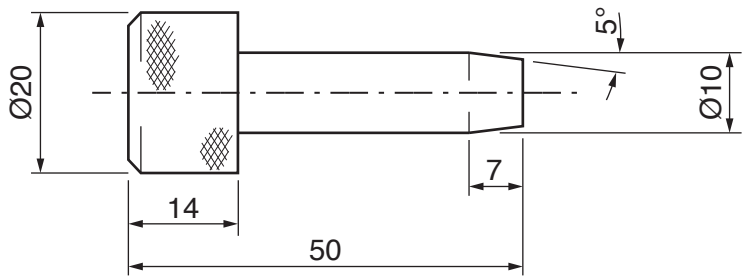
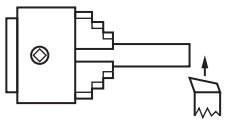
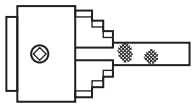
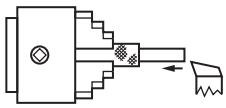
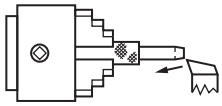
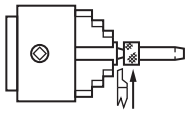


Fig. 2

(a) The table below shows processes used to make the locating peg on a centre lathe.

Complete the table by giving the name of each of the processes shown.

	Process	Description of process	Name of process
Stage 1		**Cutting across the end of the Ø20 mild steel bar**	
Stage 2		**Putting a grip on the outside of the bar**	
Stage 3		**Reduce the peg to Ø10**	
Stage 4		**Putting the angle on the end of the peg**	
Stage 5		**Cutting off the finished peg**	

[5]

(b) (i) The section of the locating peg with Ø10 diameter is case hardened by heat treatment to reduce wear in use.

Describe how the case hardening process would be carried out.

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..... **[3]**

(ii) Name **two** other heat treatment processes.

1 .....

2 .....

[2]

5 **(a)** Give **two** benefits to a manufacturer of using CNC machining centres rather than CNC lathes and milling machines.

1 .....

.....

.....

2 .....

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..... **[4]**

(b) Give **two** applications of lasers in engineering production.

1 .....

2 ..... **[2]**

(c) Explain how 3D printing could be used to produce a prototype of a new product.

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..... **[4]**

6 **(a)** Describe **two** ways that digital communications might be used in research and development.

1 .....

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2 .....

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..... **[4]**

(b)* Discuss the business benefits of 'global manufacturing'.

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..... **[6]**

END OF QUESTION PAPER

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