

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
LEVEL 1/2
R109/01
CAMBRIDGE NATIONAL IN
ENGINEERING MANUFACTURE
Engineering materials, processes and
production
THURSDAY 18 MAY 2017: Afternoon
DURATION: 1 hour
plus your additional time allowance
MODIFIED ENLARGED 24pt**

| | | | | | | | | | | |
|-------------------------------|--|--|--|--|--|------------------------------|--|--|--|--|
| Candidate forename | | | | | | Candidate surname | | | | |
| Centre number | | | | | | Candidate number | | | | |

Candidates answer on the Question Paper.

**OCR SUPPLIED MATERIALS:
None**

**OTHER MATERIALS REQUIRED:
None**

READ INSTRUCTIONS OVERLEAF



INSTRUCTIONS TO CANDIDATES

Use black ink. HB pencil may be used for graphs and diagrams only.

Complete the boxes on the first page 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).

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 (*).

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 _____

- 3 _____

[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.

[3]

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

1 _____
2 _____

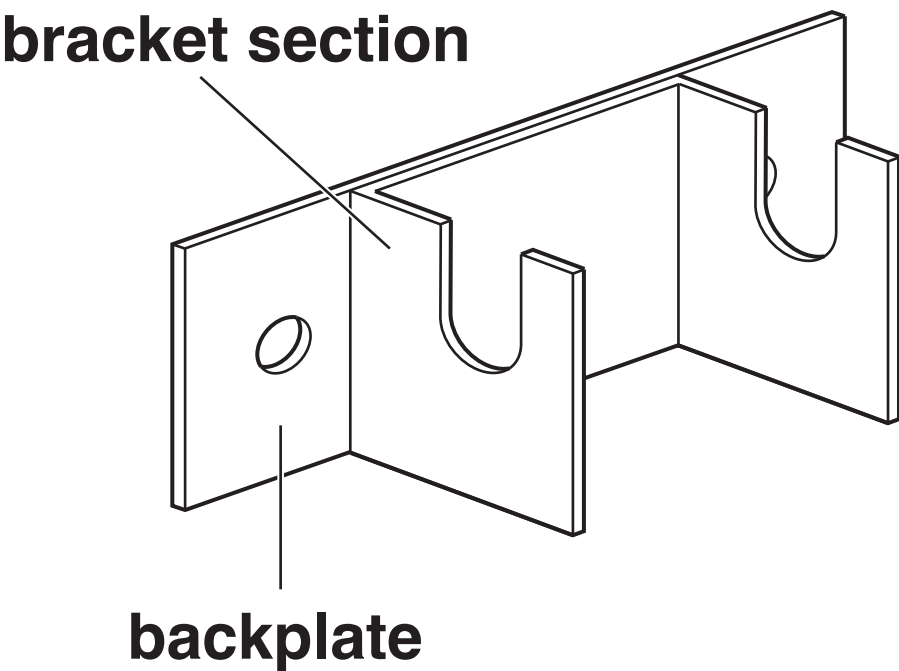
[2]

(c) Explain, using ONE example, what is meant by the term ‘non-destructive testing’ (NDT).

[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. [5]

| | 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 |

(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.

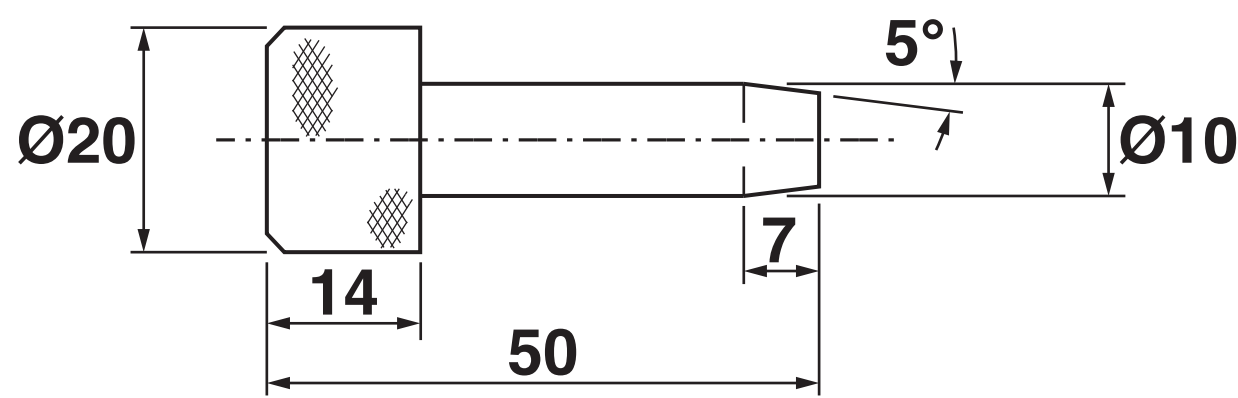
Method _____

Description _____

[3]

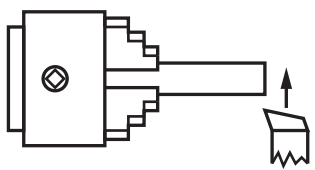
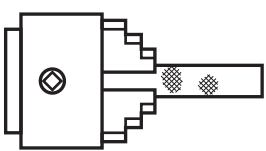
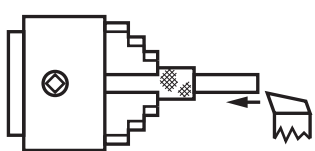
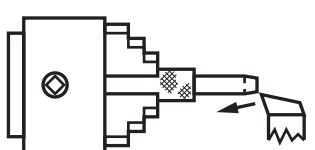
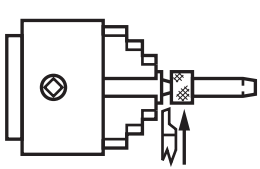
4 Fig. 2 shows a locating peg made from mild steel.

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. [5]

| | 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 | |

- (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.

[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
-
-
- [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.
-
-
-
-
-
- [4]

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

1 _____

2 _____

[4]

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

[6]

END OF QUESTION PAPER



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