

OCR

Oxford Cambridge and RSA

Thursday 14 May 2015 – Afternoon**LEVEL 1/2 CAMBRIDGE NATIONAL IN ENGINEERING
MANUFACTURE****R109/01** Engineering materials, processes and production

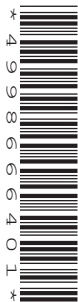
Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

None

Duration: 1 hour

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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.
- Do **not** write in the bar codes.

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
Brass
Cast iron
Concrete

Copper
High speed steel
HIPS
Polycarbonate

PVC
Stainless steel
Tin
Zinc

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

(i) and are polymers. [2]

(ii) is a composite material. [1]

(iii) and are non-ferrous metals. [2]

(iv) is an alloy. [1]

(b) Describe what is meant by the term 'thermoplastic'.

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

(c) Explain why an alloy might be preferred to a pure metal for making an engineered product.

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

2 (a) Give **two** properties of brass that make it suitable for making electrical components.

1

2 [2]

(b) Name **two** specific engineering materials that are often supplied in sheet form.

1

2 [2]

(c) Describe, giving examples, **one** application of each of the following smart materials.

Shape-memory alloy

.....

.....

..... [3]

Quantum Tunnelling Composite (QTC)

.....

.....

..... [3]

4

3 Fig. 1 shows a pipe support made from steel.

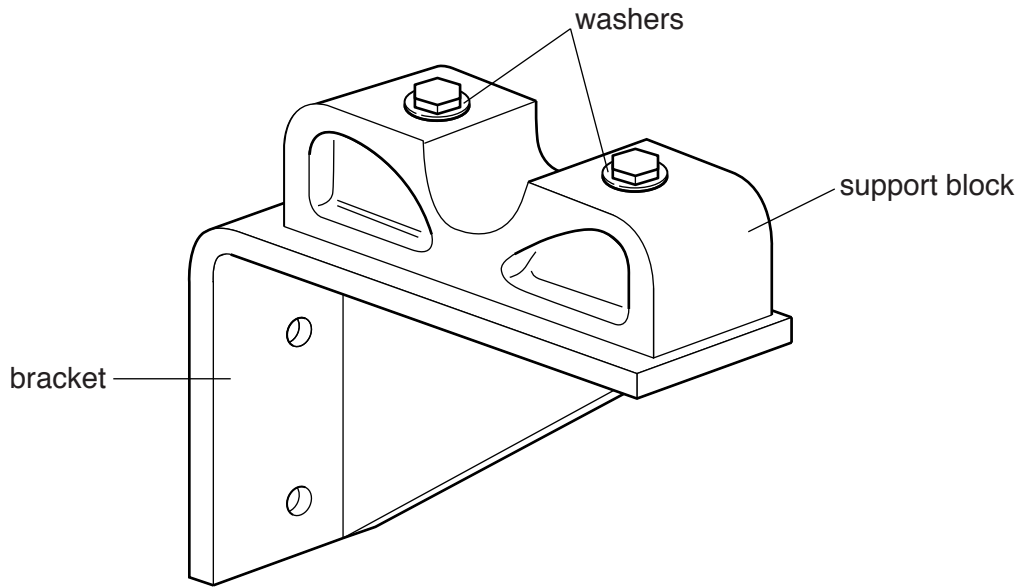


Fig. 1

(a) (i) Name **one** forming process that could be used to produce the support block shown in Fig. 1.

..... [1]

(ii) Give **two** advantages of forming processes compared with machining processes.

1

.....

2

.....

[2]

(b) The two parts of the pipe support are joined using nuts and bolts.

Give **two** other methods of permanently joining the support block to the bracket.

1

2

[2]

(c) Give **two** suitable finishes for the parts of the pipe support.

1

2

[2]

(d) Explain why fixing components, such as nuts and bolts, are often bought in by manufacturers of engineered products.

.....

.....

.....

.....

..... [3]

6

4 Fig. 2 is a line diagram of a vertical milling machine.

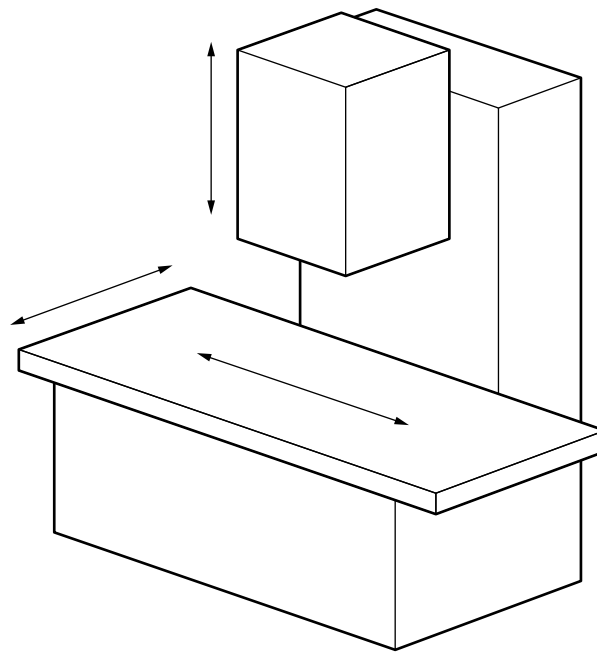


Fig. 2

(a) Label the arrow on Fig. 2 that shows the 'Z' axis of the milling machine. [1]

(b) Give **three** safety precautions, other than wearing PPE (Personal Protective Equipment), that should be taken when operating a milling machine.

1

2

3

[3]

(c) Milling is a material removal process.

Name **two** other material removal processes.

1

2

[2]

(d) Investment casting is a forming process used to produce complex items.

(i) Complete the table below by adding the stages of the 'lost wax' investment casting process.

Stage 1	Prepare a wax pattern of the item required
Stage 2	
Stage 3	
Stage 4	
Stage 5	Remove the completed casting from the mould

[3]

(ii) Name **one** other metal casting process.

..... [1]

5 Computer Numerically Controlled (CNC) machines have largely replaced manually operated machines in engineering production.

(a) (i) Explain why a CNC lathe would be preferred to a conventional centre lathe for large scale production of engineering components.

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

(ii) Name **two** other CNC machines used in engineering production.

1
2 [2]

(b) Give **two** benefits to the workforce of using CNC machines in engineering production.

1
2 [2]

(c) Describe **one** additive manufacturing process.

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

6 (a) Describe **two** ways in which modern technologies might be used in the development of new products.

1

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2

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.....

[4]

(b)* Discuss the cost implications of introducing modern technologies for manufacture and assembly of products.

.....

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..... [6]

END OF QUESTION PAPER

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