



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.

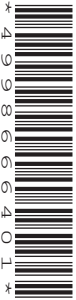
**OCR supplied materials:**

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]

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

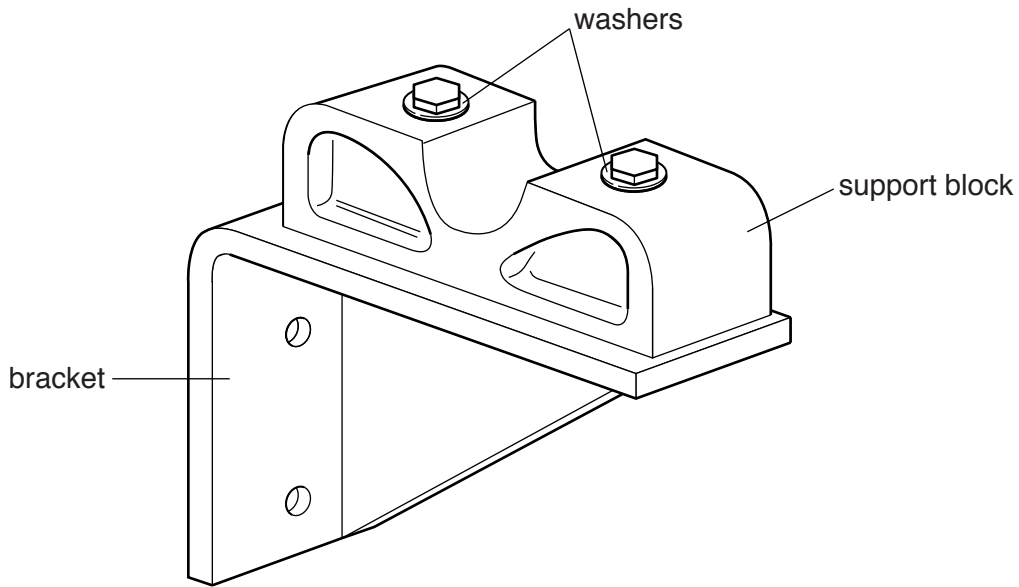


Fig. 1

(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]

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

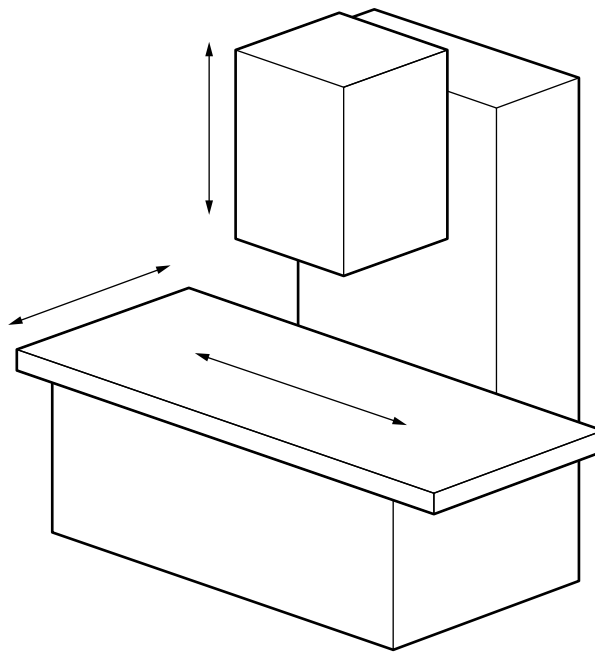


Fig. 2

(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.

<b>Stage 1</b>	Prepare a wax pattern of the item required
<b>Stage 2</b>	
<b>Stage 3</b>	
<b>Stage 4</b>	
<b>Stage 5</b>	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 .....

.....

.....

2 .....

.....

.....

[4]

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

**END OF QUESTION PAPER**

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