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

* R 1 0 9 0 1 *

* 4 9 9 8 6 6 6 4 0 1 *

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.
- 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	**Copper**	**PVC**
Brass	**High speed steel**	**Stainless steel**
Cast iron	**HIPS**	**Tin**
Concrete	**Polycarbonate**	**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.

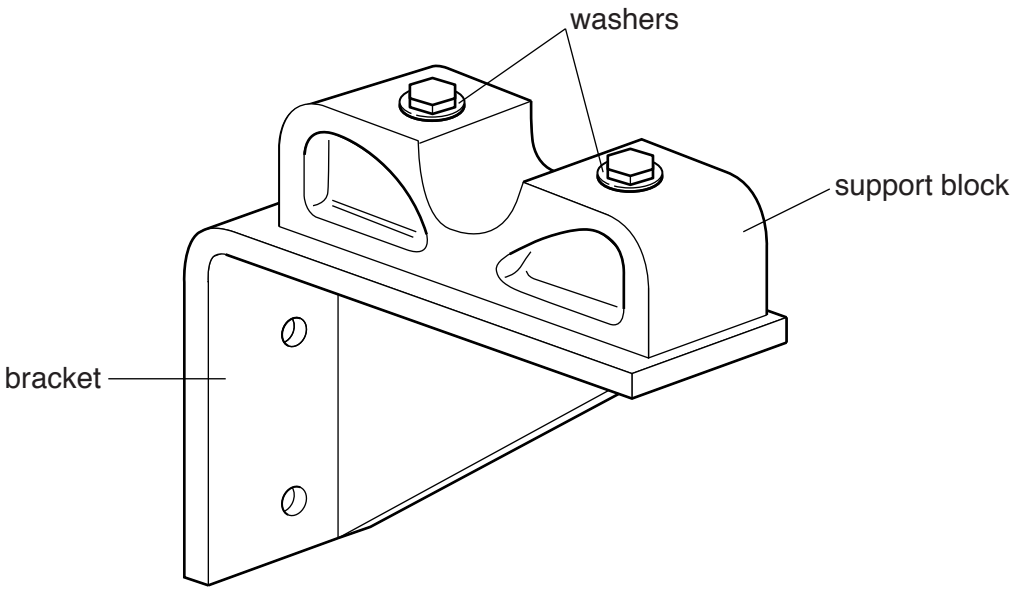

Fig. 1

(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.

.....

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.....

.....

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

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

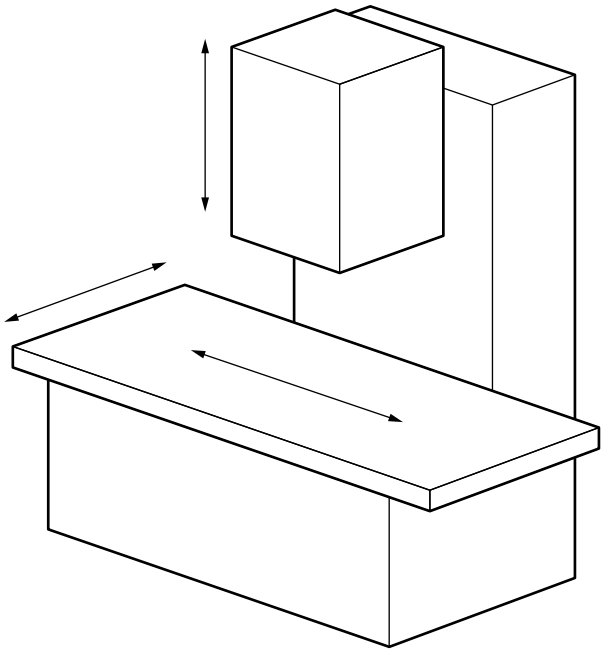

Fig. 2

(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.

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 .....

.....

.....

2 .....

.....

.....

[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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