Modified Enlarged 24pt

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Tuesday 12 January 2021 – Afternoon

Level 1/2 Cambridge National in Engineering Manufacture

R109/01 Engineering materials, processes and production

Time allowed: 1 hour
plus your additional time allowance

No extra materials are needed.

Please write clearly in black ink.

Centre number | | | | | |

Candidate number | | | | |

First name(s) _____

Last name _____

READ INSTRUCTIONS OVERLEAF

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INSTRUCTIONS

Use black ink. You can use an HB pencil, but only for graphs and diagrams.

Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.

Answer ALL the questions.

INFORMATION

The total mark for this paper is 60.

The marks for each question are shown in brackets [ ].

Quality of written communication will be assessed in questions marked with an asterisk (*).

ADVICE

Read each question carefully before you start your answer.

Answer ALL the questions.

1 (a) Fig. 1 shows a lead fishing weight.

FIG. 1

(i) Give TWO reasons why lead is suitable for the fishing weight.

1 _____

_____

2 _____

_____

[2]

(ii) Give ONE reason why lead weights are banned in some areas and alternative materials have to be used.

_____

_____ **[1]**

(b) Fig. 2 shows a boat propeller.

FIG. 2

(i) Circle the material commonly used to make a boat propeller. [1]

bronze
mild steel
glass reinforced plastic (GRP)
epoxy resin

(ii) Circle the term from the list below which describes the type of material used in the casting process used to manufacture the boat propeller. [1]

ferrous metal
alloy
ceramic
composite

(iii) **Give TWO reasons why the material is suitable for the propeller.**

1 _____

_____

2 _____

_____

[2]

(c) Fig. 3 shows a toy tipper truck.

FIG. 3

(i) Circle the material commonly used to make the body of the toy tipper truck. [1]

zinc
Acrylonitrile-Butadiene-Styrene (ABS)
iron
polyester resin

(ii) Give TWO reasons why the material chosen is suitable for the body of the toy tipper truck.

1 _____

_____

2 _____

_____

[2]

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2 A list of engineering materials is given below.

polyester resin
copper
concrete
glass
nylon
stainless steel
polyvinyl chloride (PVC)

(a) Select a suitable material from the list to complete the following statements. [5]

(i) _____ is a non-ferrous metal.

(ii) _____ is a ferrous metal.

(iii) _____ is a ceramic.

(iv) _____ is a thermosetting plastic.

(v) _____ is a thermoplastic.

(b) (i) Explain what is meant by the term 'composite material'.

_____

_____

_____ **[2]**

(ii) **Name ONE composite material and state ONE use for the material.**

Composite material _____

Use _____

_____

[2]

(iii) **Give ONE property of the material that makes it suitable for the use identified in 2(b)(ii).**

_____

_____ **[1]**

3 Material removal, joining and surface treatment are all engineering processes.

(a) Name TWO hand methods used for material removal.

1 _____

2 _____

[2]

(b) Name TWO CNC processes that could be used for material removal.

1 _____

2 _____

[2]

(c) Name TWO processes used when joining metals.

1 _____

2 _____

[2]

(d) A piece of mild steel plate 100 mm × 25 mm × 3 mm is to be surface treated by plastic coating. Describe how this would be carried out.

_____

_____

_____

_____

_____

_____ [3]

(e) Name ONE surface treatment, other than plastic coating, that could be applied to mild steel.

_____ [1]

4 Fig. 4 opposite shows a vacuum forming machine.

(a) Select the parts from the list below that have been labelled in Fig. 4.

vacuum pressure gauge	**clamping frame**
mould shelf	**heater**
vacuum pump switch	**shelf lever**
toggle clamp	**sliding bars**

A _____

B _____

C _____

D _____

E _____

[5]

FIG. 4

(b) The table below shows the stages involved in vacuum forming a shape.

Stage	Process
F	Place the mould in the vacuum former.
G	Raise the shelf and switch on the vacuum pump.
H	Heat the plastic sheet until it is flexible.
I	Lower the shelf supporting the mould.
J	Clamp a sheet of plastic into position.
K	Leave the plastic sheet to cool and then remove from the vacuum former.

Put the stages in the correct order. Two have been completed for you. [3]

F					K

(c) State TWO processes, other than vacuum forming, of moulding plastic sheet.

1 _____

2 _____

[2]

5 (a) Explain, giving an example, what is meant by the term ‘manually controlled production’.

_____

_____

_____ [2]

(b) Fig. 5 shows a wrench that has been produced using an additive manufacturing process.

FIG. 5

(i) Name ONE appropriate additive manufacturing process to make the wrench shown in Fig. 5.

_____ [1]

(ii) **Explain how the process named in 5(b)(i) would be used to produce the wrench.**

_____

_____

_____

_____

_____

_____ **[3]**

(c) **Describe the advantages of using CNC machines rather than manual production.**

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

6 (a) **Using an example, describe the reasons for developing new and emerging engineering materials.**

Example _____

Reasons _____

_____

_____

_____

_____

[4]

(b)* **Discuss the advantages and disadvantages to a manufacturer of introducing modern technology.**

[6]

_____

_____

_____

_____

_____

_____

_____

_____

END OF QUESTION PAPER

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