1145-502 JUNE 2018
Level 2 Technical Award in Engineering
Level 2 Engineering – Theory exam (1)

General instructions
• Use black or blue ballpoint pen.
• The marks for questions are shown in brackets.
• There are eight questions in this examination paper. Answer all questions.
• Answer the questions in the spaces provided. Answers written in margins will not be marked.
• Cross through any work you do not want to be marked.
• Write all of your working out and answers in this booklet.
• If extra space is required, then the blank pages at the back of the pack should be used, clearly identifying the question.
1  a) What does the symbol in Figure 1 represent on an orthographic drawing? (1 mark)

![Figure 1](image1)

b) An orthographic projection of an engineered product is shown in Figure 2. Label the three views shown. (3 marks)

![Figure 2](image2)

c) State the meaning of each of the following abbreviations on an engineering drawing.
   i) CHAM. (1 mark)

   ii) CSK. (1 mark)

(Total marks 6)
2  a) Define each of the following material properties.
   i) Thermal conductivity.
      
   ii) Hardness.

b) i) A motor is a commonly used electrical component. What is the function of a motor?

   ii) State the unit in which the electrical power of a motor is measured.
c) i) Which one of the following is the symbol for a thermistor? (1 mark)

![Symbols A, B, C, D]

ii) Describe the function of a thermistor. (1 mark)

iii) Give one practical application of a thermistor and explain how it is used in this application. (3 marks)

(Total marks 9)
3  a) Turning is used to remove material from a component. Give an example of an application where this might be used. (1 mark)

b) For each of the following types of materials, name one typical product that can be made from them.
   i) Thermosetting polymer. (1 mark)

   ii) Engineering ceramic. (1 mark)

c) Describe the properties of a thermochromic material and give one typical example of an application of this material. (2 marks)

d) Name two types of adhesives used by engineers. (2 marks)

(Total marks 7)
4 a) Give **four** reasons why a designer would use a block model to create a prototype product. (4 marks)

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b) Prototype models can be made from foam blocks. Describe **two** ways in which a model made from foam blocks can be rendered to give it a realistic appearance. (2 marks)

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(Total marks 6)
5 a) An engineering drawing is drawn to a scale of 1:100. A line is drawn 10 mm long. What length would this be at full scale? (1 mark)

b) CAD systems can be used to create 3D models of a product. Describe what each of the following tools does within a CAD model.
   i) Extrude. (2 marks)

   ii) Revolve. (2 marks)

   iii) CoSweep. (2 marks)

   iv) Slice. (2 marks)

   v) Mirror. (2 marks)

c) A designer has 3D CAD models of three separate components. Explain how they can be assembled together into a single product using the CAD software. (3 marks)

   i) Use the Assembly feature to position and orient the components as required.

   ii) Use the Welding feature to create a single, integrated structure.

   iii) Use the Taper feature to smoothly transition between components.

(Total marks 8)
6 a) Name four pieces of information that would be shown within the title block of an engineering drawing. (4 marks)

b) Explain how a wiring diagram is different to a schematic diagram. (3 marks)

c) Explain the purpose of each of the following types of drawing.

i) Assembly. (2 marks)

ii) Detail/component. (2 marks)

iii) Block diagram. (2 marks)

(Total marks 13)
7 a) Figure 3 shows a disposable plastic coffee cup. Explain **two** benefits and **two** limitations of using plastic to make the cup, compared to other materials. (8 marks)
b) Describe the process of injection moulding a plastic cup. (6 marks)

Explanation of the process:

1. **Injection**:
   - Melted plastic is injected into a mould.
   - The mould is typically made of metal or ceramic.

2. **Cooled mould**:
   - The plastic cools and solidifies inside the mould.
   - The cooling time is critical to ensure the plastic has hardened sufficiently.

3. **Ejection**:
   - Once the plastic has cooled, the mould is opened, and the cup is ejected.
   - The mould must be designed to allow the cup to be easily removed.

4. **Post-processing**:
   - The cups may undergo further processing, such as trimming excess material or applying labels.

Explain why a manufacturer would choose to use injection moulding to make plastic cups. (5 marks)

- **Consistency and Quality**: Injection moulding allows for high-quality, consistent products.
- **Efficiency**: The process is highly automated, leading to increased efficiency.
- **Cost-effectiveness**: Large-scale production can reduce costs per unit.
- **Variety**: It can produce a wide variety of shapes and designs.
- **Reduced Waste**: The process minimizes waste compared to other methods.
8 Figure 4 shows a fire extinguisher that is produced in large quantities for use in the home or small businesses.

Figure 4

Discuss how well this fire extinguisher meets each of following design criteria.

- Function.
- Cost.
- Suitable to be manufactured in large volumes.
- Resistance to impact.
- Ability to be easily moved.
- Sustainability.  

(12 marks)
Question 8 continued

(Total marks 12)