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

Wednesday 14 March 2018
13:30 – 15:30

General instructions
• Use black or blue ballpoint pen.
• The marks for questions are shown in brackets.
• There are six 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.

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ST00051929   A3   PO4500132019   10350439
1 a) State the meaning of the abbreviation AF on an engineering drawing. 

1 mark

b) Explain the purpose of a countersink on an engineered product. 

2 marks

c) Explain the purpose of knurls and how these are produced on a component. 

3 marks

d) Give three reasons why a designer may choose to design a 3D virtual model of an assembly rather than a physical model. 

3 marks
e) A designer has used the following different types of line on an orthographic drawing as shown in Figure 1.

![Figure 1](image)

State which of the lines represents the
i) centre line (1 mark)

ii) hidden detail. (1 mark)

f) Describe where the value of the dimension should be placed on the dimension line in Figure 2. (2 marks)

![Figure 2](image)
2   a) Define **each** of the following material properties.

i) Compressive strength.  

ii) Toughness. 

b) Name the process shown in Figure 3. 

![Figure 3](image)

Give **two** safety precautions that should be taken when milling a flat surface on a block of stainless steel and say what benefit **each** provide. 

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d) For each of the following types of materials, name one typical product that can be made from them.

i) Non-ferrous metal.  

ii) Thermoplastic polymer. 

iii) Shape Memory Alloy. 

e) Describe the process of joining pieces of aluminium using TIG (Tungsten Inert Gas) welding.

(Total marks 16)
3 a) Explain the purpose of using flux when soldering electrical components to a printed circuit board. (3 marks)

b) An electrical resistor has a specification of 330 ohms with a tolerance of +/- 10%. What are the possible minimum and maximum values of the resistor? (2 marks)

c) State the purpose of each of the following components and give for each an example of a typical application in a circuit.
   i) Capacitor. (2 marks)

   ii) Diode. (2 marks)

d) Explain the difference between how a voltmeter and an ammeter are used. (2 marks)
e) Describe the benefits and limitations of producing drawings by hand compared to the use of CAD software.  

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(Total marks 17)
4  a) What is the accuracy of the steel rule shown in Figure 4? (1 mark)

![Figure 4](image)

b) State the units in which each of following are measured.
   i) Volume. (1 mark)

   ii) Area. (1 mark)

   iii) Power. (1 mark)

c) State three different properties or characteristics that can be measured by a multimeter. (3 marks)

d) Describe the procedure for taking a reading using a manual micrometer. (3 marks)

(Total marks 10)
5 a) Describe how to prepare a mould for sand casting. (5 marks)

b) Give three functions of a riser (feeder head) when sand casting a metal product. (3 marks)
c) The component shown in Figure 5 is made using sand casting. Explain why this technique would be used rather than conventional machining processes. (4 marks)

Figure 5

(Total marks 12)
Figures 6, 7 and 8 show different types of electric desk fans.

Figure 6 – Fan A

Figure 7 – Fan B

Figure 8 – Fan C
Discuss how well each of these fans meet the following design criteria for an environment where there are small children.

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

(Total marks 12)
Additional Space

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