VCE VET ENGINEERING STUDIES

Written examination

Wednesday 20 November 2013

Reading time: 9.00 am to 9.15 am (15 minutes)
Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

<table>
<thead>
<tr>
<th>Section</th>
<th>Number of questions</th>
<th>Number of questions to be answered</th>
<th>Number of marks</th>
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<tbody>
<tr>
<td>A</td>
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<td>Total</td>
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• Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, a protractor, a set square and aids for curve sketching.
• Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
• A scientific calculator is allowed in this examination.

Materials supplied
• Question and answer book of 31 pages.
• Answer sheet for multiple-choice questions.

Instructions
• Write your student number in the space provided above on this page.
• Check that your name and student number as printed on your answer sheet for multiple-choice questions are correct, and sign your name in the space provided to verify this.
• All written responses must be in English.

At the end of the examination
• Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.
Use Figure 1 to answer Questions 1–9.

Figure 1 shows an electrical circuit.

**Figure 1**

**Question 1**
Which one of the following would be the best material for the circuit conductors shown in Figure 1?
A. steel  
B. ceramic  
C. copper  
D. PVC

**Question 2**
What is the value, in ohms, of R2?
A. 4.7 ohms  
B. 470 ohms  
C. 4700 ohms  
D. 47 000 ohms

**Question 3**
The component labelled ‘A’ is
A. a cell.  
B. a battery.  
C. a capacitor.  
D. an inductor.
Question 4
If the voltage across R1 was 2.2 volts, what current would be flowing through it?
A. 1 milliampere
B. 10 milliamperes
C. 10 microamperes
D. 100 milliamperes

Question 5
Closing S1 would
A. create a short circuit.
B. increase circuit current.
C. decrease circuit current.
D. not affect circuit current.

Question 6
The symbol labelled ‘B’ indicates that the
A. circuit is earthed.
B. circuit has a second battery.
C. circuit has overvoltage protection.
D. circuit is suitable for alternating current only.

Question 7
With the switch in Figure 1 open, a voltmeter fitted in parallel with S1 would read
A. zero volts.
B. the voltage across R1.
C. the voltage across R2.
D. the total applied circuit voltage.

Question 8
S1 can be used to
A. dim the lamp.
B. turn off the lamp.
C. turn the entire circuit on.
D. turn the entire circuit off.

Question 9
Which effect of an electrical current is not present?
A. the thermal effect
B. the chemical effect
C. the magnetic effect
D. the piezoelectric effect
Question 10

The symbol shown in Figure 2 indicates that an electrical device
A. is uninsulated.
B. is for DC current only.
C. must be installed in an insulated enclosure.
D. does not need an earth connection for safe operation.

Question 11
Which meter can directly measure the power in an electrical circuit?
A. an ammeter
B. a wattmeter
C. a multimeter
D. an ohmmeter

Question 12
A photovoltaic cell can
A. charge a battery.
B. form part of a light meter.
C. directly power an electronic circuit.
D. be used in all of the above applications.

Question 13

Identify the connections on the 240 V AC plug top shown in Figure 3.
A. 1 – active 2 – earth 3 – neutral
B. 1 – neutral 2 – active 3 – earth
C. 1 – earth 2 – active 3 – neutral
D. 1 – earth 2 – neutral 3 – active
Question 14

![Figure 4](image)

What is the total resistance of the circuit shown in Figure 4?
A. 2240 ohms  
B. 1680 ohms  
C. 1120 ohms  
D. 560 ohms

Question 15

![Figure 5](image)

Which electrical component is represented by the symbol shown in Figure 5?
A. diode  
B. capacitor  
C. variable resistor  
D. light-emitting diode
SECTION B – VBN 773 Produce basic engineering sketches and drawings

Instructions for Section B

Answer all questions in the spaces provided. All dimensions are in mm (millimetres).

Figure 1 shows an isometric view of a machine part, with the three holes going all the way through.

Figure 1
**Question 1** (4 marks)
On the sketch below, complete the top, side and end views of the machine part shown in Figure 1.
- Use conventional drawing systems.
- Show views in third-angle projection.
- Show all hidden detail and centre lines.
Question 2 (4 marks)
Figure 2 shows an angle iron bracket with two holes.
Correctly dimension the drawing using the following information.
• The angle iron is $40 \times 40 \times 150$.
• Both holes are Ø 12.
• The holes are 25 mm from one end and 100 mm between centres.
Question 3 (3 marks)
Figure 3 shows a machine slide.

Figure 3

In the space provided below, sketch an isometric view of the machine slide shown in Figure 3.
Question 4 (4 marks)
Describe what each of the drawing symbols shown below represents.
Figure 1 shows a base plate made from 3 mm thick, bright mild steel.

Figure 1

<table>
<thead>
<tr>
<th>Tolerances</th>
<th>Name:</th>
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<tbody>
<tr>
<td>Unless Otherwise Stated:</td>
<td>Base Plate</td>
</tr>
<tr>
<td>Diameters ± 0.1</td>
<td>Material:</td>
</tr>
<tr>
<td>Lengths ± 0.5</td>
<td>3 mm Bright Mild Steel</td>
</tr>
<tr>
<td>Finish µ 3.2</td>
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</tbody>
</table>
The base plate shown in Figure 1 will be made from a piece of 3 mm × 100 mm wide, bright mild steel that has been cut to 153 mm long, as shown in Figure 2.

**Figure 2**

**Question 1 (8 marks)**

a. Before marking out, the two edges will need to be square to each other.
   Draw arrows on Figure 2 to show which two faces will need to be square. 1 mark

b. The bright mild steel plate makes it difficult to see the marking out lines.
   List two things that can be done to make the marking out more visible. 2 marks
   • 
   •

c. List four tools required to mark out the base plate. 2 marks
   •
   •
   •
   •
   •

**Figure 3**

d. When dimensions are taken from an edge, indicated by the arrow in Figure 3, what is this edge called? 1 mark
After marking out, the excess material shown shaded in Figure 4 will be removed before filing to final size.

\[\text{Figure 4}\]

e. Suggest one way that the excess material could be cut away.  

f. Which one of the following files would be the most suitable to finish filing the R12 radii to shape?

A. square file
B. warding file
C. round file
D. flat file
E. needle file
Figure 5 shows a drawing of a slide block.

<table>
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<td>Slide Block</td>
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<td>Finish $\mu$ 3.2</td>
<td>Material:</td>
</tr>
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<td></td>
<td>Brass</td>
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</table>

**Figure 5**

**Question 2 (7 marks)**

a. What material is the slide block made from?  

1 mark
The width, height and length of the slide block have been finish machined to $60 \times 30 \times 150$.

b. List, in the correct sequence, the operations required to complete the rest of the slide block.  

<table>
<thead>
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<th>Operation</th>
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</table>

5 marks

c. Which measuring tool would be suitable to accurately measure the width of the 20 mm step?  

1 mark
SECTION D – VBN 777  Handle engineering materials

Instructions for Section D
Answer all questions in the spaces provided.

Question 1 (1 mark)
Explain how safety shoes differ from normal footwear.

Question 2 (1 mark)
In most workplaces, employees must wear PPE.
What does PPE stand for?

Question 3 (2 marks)
You are required to lift and store 1200 × 900 metal sheets that have sharp edges.
List two ways to minimise the risk of cutting yourself.

•

•

Question 4 (1 mark)
A sling has a tag with ‘SWL 250 kg’ on it.
Explain what ‘SWL 250 kg’ means.

Question 5 (2 marks)
List two precautions that you should take when carrying a 3 metre length of Ø 25 mm steel tube through a workshop to avoid injuring yourself and others.

•

•
Question 6 (1 mark)

![Flammable Liquid Sign]

Figure 1

Suggest one precaution that needs to be followed in a work area displaying the sign shown in Figure 1.

Question 7 (3 marks)

Tick (✔) the correct boxes.

Is a licence required in order to operate the following equipment?

- [ ] Yes  [ ] No  forklift
- [ ] Yes  [ ] No  electric pallet truck
- [ ] Yes  [ ] No  hoist
Question 8 (1 mark)
The dividing head shown in Figure 2 weighs 38 kg. It is currently sitting on a milling machine table.

Figure 2

Describe one safe method of shifting the dividing head from the milling machine table to a storage shelf 15 metres away.

Question 9 (1 mark)
Why do safety glasses offer better protection than normal glasses?

Question 10 (1 mark)
Give the general name for documents that provide important information about hazardous chemicals found in workplaces.

Question 11 (1 mark)
Before using a sling, it should be inspected to make sure it is safe to use.
Give one example of something that would make a sling unsafe to use.
SECTION E – VBN 778 Produce basic engineering components and products using fabrication and machining

Instructions for Section E

Answer all questions in the spaces provided. All dimensions are in mm (millimetres).

Figure 1 shows an assembly drawing of a machine vice.

![Figure 1](attachment:image.png)
Figure 2 shows a detailed drawing of the machine vice base.

**Figure 2**

**Question 1 relates to the manufacture of the machine vice base.**

**Question 1** (11 marks)

a. Rectangular mild steel is available in the following sizes. Which size is most suitable for making the machine vice base? 1 mark

A. 75 × 40

B. 100 × 25

C. 110 × 40

D. 150 × 25
b. After the material has been cut on a saw, the ends will need to be milled square.  
What length should the material be cut to?  

The material will be held in a vice for milling the 50 mm wide slot, as shown in Figure 3.

![Figure 3](image)

**Figure 3**

c. What should be used under the material to make sure that it is sitting level in the vice?  

d. What type of milling cutter would be suitable to mill the slot?  

e. A trial cut of the slot has been made.  
How can you check that the slot is being milled parallel to the sides?  

f. After checking the trial cut, you found that the step was not parallel to the sides.  
What is the most likely cause of this?
g. The holes in the machine vice base will be marked out using the tool shown in Figure 4. What is the name of this tool? 1 mark

h. What is the main advantage of using the tool shown in Figure 4 instead of a rule and square? 1 mark

i. Which one of the following tools is called a reamer? 1 mark

A. B. C. D. E.

j. The Ø 8 holes need to be drilled before reaming. Which one of the following drill sizes would be the most suitable? 1 mark

A. 8.5
B. 8.0
C. 7.8
D. 7.0
E. 6.4
k. Give one reason why the drawing specifies reaming the Ø 8 holes and not just drilling. 1 mark
Figure 5 shows a detailed drawing of the machine vice fixed jaw.
Question 2 relates to the manufacture of the fixed jaw.

Question 2 (17 marks)
When making the fixed jaw, faces A and B have been machined square to each other. Next, the fixed jaw will be held in the vice shown in Figure 6 so that the top (shown shaded) can be milled.

a. i. Which one of the machined faces would be best to put against the vice jaw so that the top will be milled square? 1 mark

b. Which measuring tool can be used to check the angle of the bevel, indicated with an arrow, in Figure 7? 1 mark
c. The threads are M10 × 1.5
  i. What does M10 stand for? 1 mark
  ii. What does 1.5 stand for? 1 mark

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<th>Core Dia.</th>
<th>Pitch</th>
<th>Depth</th>
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Figure 8

d. Using the chart shown in Figure 8, find the tapping drill size needed for the M10 threads. 1 mark
e. The pedestal grinder shown in Figure 9 will be used to sharpen the drill, but it is unsafe to use as shown.

Explain what is wrong and why this poses a safety risk.  

f. A set of M10 taps are shown below.

Which tap should be used last when tapping the M10 threads? Explain your answer.  

A.  

B.  

C.  

Figure 9

---

g. When tapping, the tap should periodically be turned in reverse before continuing to tap.

What is the reason for this?  

h. Explain how you would check that the tap is going in square when tapping.  

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SECTION E – Question 2 – continued

TURN OVER
i. The fixed jaw of the vice has a V cut into its face, as shown in Figure 10.
What is the purpose of this V? 1 mark

Figure 10

j. The fasteners shown in Figure 11 will be used to fasten the fixed jaw to the base.
   i. What is the name of fastener A? 1 mark

   Figure 11

   ii. What is the name of the tool that is used to tighten fastener A? 1 mark

   iii. What is the name of fastener B? 1 mark

   iv. What is the purpose of using fastener B? 1 mark
Figure 12 shows a detailed drawing of the handle.

**Figure 12**

**Question 3 relates to the manufacture of the handle.**

**Question 3** (12 marks)

a. When turning down the end caps on the lathe, the cutting tool needs to be set on centre height. Explain how this is done.

b. Explain how the cutting process would be affected if the tool was set above centre height.
c. When turning down the Ø 20 on the end caps, a cut was taken and the diameter was measured with the tool shown in Figure 13.

i. What is the name of the measuring tool shown in Figure 13? 1 mark

ii. Give one example of what could cause inaccurate readings when using the tool shown in Figure 13. 1 mark

iii. What is the measurement of the diameter, as shown in Figure 14? 1 mark

iv. Based on the measurement shown in Figure 14, what distance does the cutting tool need to be moved in for the final cut to make the Ø 20? 1 mark

v. What is the name of the slide on the lathe that is used to move the cutting tool to set the diameter? 1 mark

d. Explain how the 2 × 45° chamfer is put on the end cap. 1 mark
Figure 15

e. The hole for the M4 thread will need to be marked and drilled in a drilling machine. Explain how the hole is drilled accurately through the centre of the end cap, as shown in Figure 15. 2 marks

f. The fastener shown in Figure 16 will be used to hold the end caps on the bar. What is the name of this type of fastener? 1 mark

g. Why is this fastener preferred over a normal screw or bolt in this situation? 1 mark