VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education
2018

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Letter

VCE VET ENGINEERING STUDIES

Written examination

Tuesday 20 November 2018

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>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

• Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one scientific calculator, 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 correction fluid/tape.

Materials supplied
• Question and answer book of 23 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.
• Unless otherwise indicated, the diagrams in this book are not drawn to scale.
• 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.

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SECTION A – Multiple-choice questions

Instructions for Section A
Answer all questions in pencil on the answer sheet provided for multiple-choice questions. Choose the response that is correct or that best answers the question. A correct answer scores 1; an incorrect answer scores 0. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question. Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Question 1
‘Red tagging’ is usually a part of which 5S step?
A. Set
B. Sort
C. Shine
D. Standardise

Question 2
Which one of the following represents a 10 mm thread on an engineering drawing?
A. Ø 10
B. M10
C. T10
D. R10

Question 3
A 6 m length of pipe is being cut into 60 mm long pieces. If the width of the saw blade is 3 mm, what is the maximum number of pieces that can be cut?
A. 85
B. 90
C. 95
D. 100

Question 4
Which one of the following statements about manual lifting is true?
A. Only use mechanical lifting aids as a last resort.
B. Always use two people if the load exceeds 10 kg.
C. Bend over and use the back muscles to lift the load off the ground.
D. The person lifting the load should keep it as close as possible to their body.
**Question 5**
The acronym EPA stands for
A. Environment Prevention Actions.
B. Environment Protection Authority.
C. Environment Performance Agency.
D. Environment Permanent Association.

**Question 6**
Sectional views on drawings are used to show
A. hidden detail.
B. how parts fit together.
C. the position of all holes.
D. the materials that parts are made from.

**Question 7**

Which letter on the drawing above shows the datum?
A. A
B. B
C. C
D. D

**Question 8**
In the 5S system, Set in order has two main components. The first component is finding the best location for everything.
The second component is
A. making a list of what has been kept.
B. removing everything else from the area.
C. visually marking where everything belongs.
D. holding a meeting to let everyone know where things are.
Question 9
Which one of the following lifting accessories is best suited to lifting an engine out of a car with a block and tackle?
A. eye bolt
B. plate clamp
C. hydraulic jack
D. strong magnet

Question 10
Which of the following are environmental hazards in the workplace?
A. noise and stress
B. gases and lifting
C. traffic and chemicals
D. electricity and office equipment

Question 11
A cleaning solution requires a ratio of 1:3, chemical to water.
How much chemical is required for a cleaning solution made with 9 L of water?
A. 1 L
B. 3 L
C. 6 L
D. 9 L

Question 12
A bin full of steel shafts weighs 117.6 kg.
If the bin weighs 28 kg when empty and one steel shaft weighs 1.4 kg, how many steel shafts are in the bin?
A. 104
B. 94
C. 84
D. 64
Question 13

![Triangle Diagram]

What is the area of the triangle shown above?
A. 2 m\(^2\)
B. 4 m\(^2\)
C. 8 m\(^2\)
D. 16 m\(^2\)

Question 14

![Bar Chart]

According to the bar chart shown above, which industry used the most water from the public supply?
A. food/drink
B. textiles
C. paper
D. metal

Question 15

Which one of the drawing symbols shown below represents a fillet weld?

A.  
B.  
C.  
D.  

A.  
B.  
C.  
D.  

SECTION A – continued

TURN OVER
Question 16
Amanda works in a company that is implementing the 5S system. A cleaning schedule has just been introduced and all team members have been assigned specific cleaning tasks.
The 5S step that has been implemented is
A. Sort.
B. Sustain.
C. Set in order.
D. Standardise.

Question 17
In the safety hierarchy of control, which one of the following is the highest priority?
A. substitution
B. engineering control
C. administrative control
D. wear personal protective equipment (PPE)

Question 18
Which item of PPE is most likely to be worn as a requirement in warehouses where forklifts are frequently used?
A. hearing protection
B. high-visibility vest
C. safety glasses
D. gloves

Question 19
In Victoria, the legislation that applies to all workplaces and is aimed at reducing pollution is the
C. Environmental Regulations Act 2005.
D. Environmental Sustainability Act 2010.
Question 20

What is the volume of the bin shown above?

A. 0.025 m$^3$
B. 0.25 m$^3$
C. 2.52 m$^3$
D. 25.2 m$^3$
SECTION B

Instructions for Section B

Answer all questions in the spaces provided.
All dimensions are in millimetres (mm) except where specified.
Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Question 1 (9 marks)

Figure 1 shows part of a workshop where the 5S system is going to be implemented.

Figure 1

a. Identify one issue relating to safety and one issue relating to the 5S system in the work area shown above. 2 marks

Safety issue __________________________________________

5S issue __________________________________________

b. What is the first step in applying the 5S system to this area? 1 mark

__________________________________________

c. Give two recommendations for what could be done to this area in order to fulfil the 5S step Set in order. 2 marks

1. __________________________________________

__________________________________________

2. __________________________________________

__________________________________________
d. What are two considerations when deciding where each item should be stored in the workshop?  
1. 
2. 

2 marks

e. Once the 5S system has been implemented, what are two actions that could be applied to sustain it?  
1. 
2. 

2 marks

Question 2 (3 marks)
An operator spends most of the work day machining stub axles. Each stub axle weighs 4 kg. A stub axle is shown in Figure 2.
After machining, the operator stores each stub axle in the storage bin shown in Figure 3, which is on the ground behind him.

![Figure 2](stub_axle.png)  
![Figure 3](storage_bin.png)

a. Describe two specific safety hazards associated with this process of machining and storage.  
1. 
2. 

2 marks

b. Other than wearing the correct personal protective equipment (PPE), suggest one improvement that would reduce the risks associated with the safety hazards described in part a.  

1 mark
Question 3 (2 marks)
Give two possible consequences for companies identified as having breached government environmental legislation.

1. ____________________________________________

2. ____________________________________________

Question 4 (2 marks)
The indexing head shown in Figure 4 weighs 38 kg. It needs to be lifted off the floor and transferred onto the milling machine table.

![Figure 4](image)

Figure 4

Describe two ways in which the indexing head could be safely moved from the floor to the milling machine table.

1. ____________________________________________

2. ____________________________________________
Question 5 (3 marks)
Describe the **best** way to visually mark the location of each item listed in the table below when implementing the 5S system.

<table>
<thead>
<tr>
<th>Item</th>
<th>Best way to visually mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>set of spanners</td>
<td></td>
</tr>
<tr>
<td>portable welder stored on the floor</td>
<td></td>
</tr>
<tr>
<td>small boxes of bolts on a shelf</td>
<td></td>
</tr>
</tbody>
</table>

Question 6 (1 mark)
What resource is being wasted in a company that has air leaks in its compressed air pipes?

________________________________________________________________________

Question 7 (1 mark)
In what way does a typical factory contribute to greenhouse gas emissions?

________________________________________________________________________

________________________________________________________________________

Question 8 (2 marks)
List two things that should be checked on a sling before it is used.

1. ________________________________________________________________

2. ________________________________________________________________
**Question 9** (6 marks)

Figure 5 shows a metal slide.

![Figure 5](image)

Sketch the metal slide shown in Figure 5 in third-angle projection in the space provided below. Show three views (top, front and side), including all centre lines and hidden lines.
**Question 10** (5 marks)

Figure 6 shows a brass block.

![Figure 6]

Sketch the brass block shown in Figure 6 in isometric view in the space provided below. The isometric view should clearly show the edge where the holes are and all centre lines.
Question 11 (3 marks)
List three actions that should be taken daily by workers in a typical engineering workshop to keep the area clean and organised under the 5S system.

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

Question 12 (3 marks)
The Sort step of the 5S system is being applied to a work area.
Give three options for what could be done with items that are not required in the immediate work area.

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________
Question 13 (2 marks)
Figure 7 is a graph showing the number of acceptable components versus rejected components produced by a company over a one-week period.

What is the percentage of rejected components manufactured for the week according to the data in Figure 7? Show your working.
Question 14 (6 marks)
Figure 8 shows a metal rubbish skip that is to be manufactured by a company.

![Figure 8]

a. Calculate the size (L × H) of the metal plate required to make the front face, which is angled and not vertical.  

b. The outside of the skip is to be painted.  
Calculate the surface area of the outside of the skip in square metres (four side faces only; do not include the bottom face). Show your working.  

c. During construction, the plates will be lifted onto a plasma cutter with a crane.  
Name an accessory that can be used with the crane to safely lift the plates.
**Question 15** (4 marks)
The drawing shown in Figure 9 has been incorrectly dimensioned.

![Figure 9](image)

**Figure 9**

Complete the drawing below so that it is correctly dimensioned from the two datums indicated by the black triangles, according to the Australian Standards for technical drawing.
**Question 16** (4 marks)
The table below shows the data collected for the number of hours of machine downtime for a lathe and a mill over a six-month period.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CNC lathe</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>CNC mill</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Use the data provided to draw a bar chart showing the combined monthly machine downtime for the lathe and the mill on the grid below.

**Machine downtime January–June 2018**
Question 17 (2 marks)

Figure 10 shows a shaft and a hole dimensioned to produce a clearance fit between the two.

According to the tolerances, what are the minimum and maximum clearances between the shaft and the hole?

Minimum _________________________

Maximum _________________________

Question 18 (4 marks)

Welding is subject to safety hazards as well as environmental hazards.

Provide one safety hazard and one environmental hazard of welding. For each hazard, include a precaution that should be taken when welding.

Safety hazard __________________________________________

Precaution __________________________________________

________________________________________________________________________________________

Environmental hazard __________________________________________

Precaution __________________________________________

________________________________________________________________________________________
**Question 19** (3 marks)

a. What does the term ‘sustainable resource’ mean?  
1 mark

________________________________________________________________________

________________________________________________________________________

b. Give an example of a natural resource that is sustainable and a natural resource that is not sustainable.  
2 marks

Sustainable natural resource ________________________________________________

Non-sustainable natural resource ____________________________________________

**Question 20** (3 marks)

C-Thru is a company that manufactures small aluminium shed windows for a retailer, who then sells these windows to the public.

The current manufacturing process is shown below. This process does not include any environmentally sustainable practices.

![Diagram of manufacturing process](image)

Three levels from the waste hierarchy of control are given in the table below.

Suggest one action that could be taken by C-Thru for each waste hierarchy level to implement environmentally sustainable practices.

<table>
<thead>
<tr>
<th>Waste hierarchy level</th>
<th>Suggested action</th>
</tr>
</thead>
<tbody>
<tr>
<td>re-use</td>
<td></td>
</tr>
<tr>
<td>recycle</td>
<td></td>
</tr>
<tr>
<td>reduce</td>
<td></td>
</tr>
</tbody>
</table>
Question 21 (3 marks)
Replacing incandescent light globes with light-emitting diodes (LEDs) will minimise energy usage.
Describe three other actions a typical manufacturing company can take to reduce energy usage.

1. 

2. 

3. 

Question 22 (3 marks)

a. In relation to the use of chemicals, what does SDS stand for? 1 mark

b. Give two pieces of information commonly found in an SDS. 2 marks

1. 

2. 

Question 23 (3 marks)

Figure 11 shows the layout of a factory site.

Figure 11

Calculate the shaded area of the factory floor in Figure 11. Show your working.

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
Question 24 (3 marks)
The pallet shown in Figure 12 is to be moved from the storage area to the operations area of a factory.

Figure 12

Source: Gearstd/Shutterstock.com

a. Name a mechanical aid that could be used to move the pallet and does not require the operator to have a licence. 1 mark

b. Describe two potential hazards when moving the pallet shown in Figure 12 from the storage area to the operations area of the factory and suggest how each hazard can be controlled. 2 marks

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>