2019 VCE VET Engineering Studies examination report

General comments

Overall, students performed well in the 2019 examination, with most students attempting the majority of the questions.

Computation questions were handled well.

Design component questions, while attempted, generally required more detail/explanation.

Areas that students most struggled with were drawings and operational planning in particular. Planning and listing the correct sequence to manufacture a basic part presented a big challenge to the majority of students.

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Question 1a.

Marks	0	1	Average
%	48	52	**0.5**

Computer Aided Design or Computer Aided Drawing

Some students had difficulty with the correct terminology.

Question 1b.

Marks	0	1	2	Average
%	44	33	22	**0.8**

Acceptable responses included:

Advantage: easy to edit / easy to share files / neater, easier to read / can save time

Disadvantage: requires training to use / cost of purchase/files can be lost

Many students focused on the speed of making up a quick sketch by hand, but did not mention the main advantages of CAD.

Question 2

Marks	0	1	2	3	4	Average
%	15	17	22	25	22	**2.2**

Sheet metal: tin snips

Steel bar: hacksaw

Wire: pliers

Nut: socket spanner

Some student answers included equipment/machines instead of hand tools as was specified in the question.

Question 3a.

Marks	0	1	Average
%	8	92	**0.9**

Any two of the following answers were accepted:

- welding gloves
- welding mask
- leather apron
- leather clothing.

This question was answered well by most students.

Question 3b.

Marks	0	1	2	Average
%	14	48	38	**1.3**

Any two of the following answers were accepted:

- curtains or screens to protect others
- no flammable items around
- good ventilation/exhaust
- welding equipment not damaged.

Some student answers for welding preparation were not related to safety.

Question 4

Marks	0	1	2	Average
%	6	17	77	**1.7**

- wasted/additional material cost
- additional time (labour)

This question was answered well by most students.

Question 5

Marks	0	1	2	3	4	Average
%	9	11	19	26	35	**2.7**

Correct answers are shown in the following table.

Part		Function or use
A	cross slide hand wheel	moves tool towards axis for cuts and facing off
B	carriage hand wheel	moves tool along axis (towards or away from chuck)
C	top slide	for turning tapers or fine adjustment of tool
D	tailstock	supporting work or holding drills, centres etc.

Some students had difficulty defining the proper function an use of the parts.

Question 6

Marks	0	1	2	3	Average
%	38	29	22	12	**1.1**

Correct names were as follows.

- angle iron
- solid rod/bar
- rectangular hollow section/RHS/rectangular tube

Some students described the basic shape (for example, round or rectangle) without any further description or providing the correct name.

Question 7

Marks	0	1	Average
%	35	65	**0.7**

$0.614 \times 1.25 = 0.77$

This question was answered well by most students.

Question 8

Marks	0	1	Average
%	35	65	**0.7**

15 mm

This question was answered well by most students.

Question 9a.

Marks	0	1	Average
%	51	49	**0.5**

The correct answer was 10.2 mm.

Question 9b.

Marks	0	1	Average
%	32	68	**0.7**

The correct answer was centre punch or centre drill the position of the hole.

This question was answered well by most students.

Question 9ci and 9cii.

Marks	0	1	2	3	Average
%	34	24	19	23	**1.3**

Question 9ci.

The correct sequence was: 1
2
3

Question 9cii.

- The tapered tap will make it easier to start and gradually cut the thread to depth.
- The final (bottoming) tap will cut the full depth thread near the bottom of hole.

Some students had difficulty explaining the correct sequence.

Question 9d.

Marks	0	1	Average
%	47	53	**0.5**

The recommended procedure is to break the chip and prevent the tap from jamming/breaking.

Most students seemed to know the reason, but some had difficulty explaining it.

Question 9e.

Marks	0	1	Average
%	36	64	**0.7**

Acceptable answers included:

- diameter of drill
- type of material being cut
- material of drill bit

This question was answered well by most students.

Question 10

Marks	0	1	Average
%	84	16	**0.2**

A protractor is used for measuring or marking out angles.

Most students knew the use, but few knew the correct name of the tool.

Question 11

Marks	0	1	Average
%	40	60	**0.6**

A tap is for making internal threads. A die is for making external threads.

The majority of students answered correctly.

Question 12a.

Marks	0	1	Average
%	76	24	**0.3**

Plain bearings consist of a shaft rotating in a hole in a suitable bearing material. Anti-friction bearings have rolling elements.

Very few students were able to describe the difference adequately.

Question 12b.

Marks	0	1	Average
%	90	10	**0.1**

Acceptable answers included:

- bronze
- cast iron
- brass
- nylon

Very few students answered this question correctly.

Question 13

Marks	0	1	2	Average
%	13	1	86	**1.7**

30 components

This question was answered well by most students.

Question 14

Marks	0	1	2	3	Average
%	6	22	31	41	**2.1**

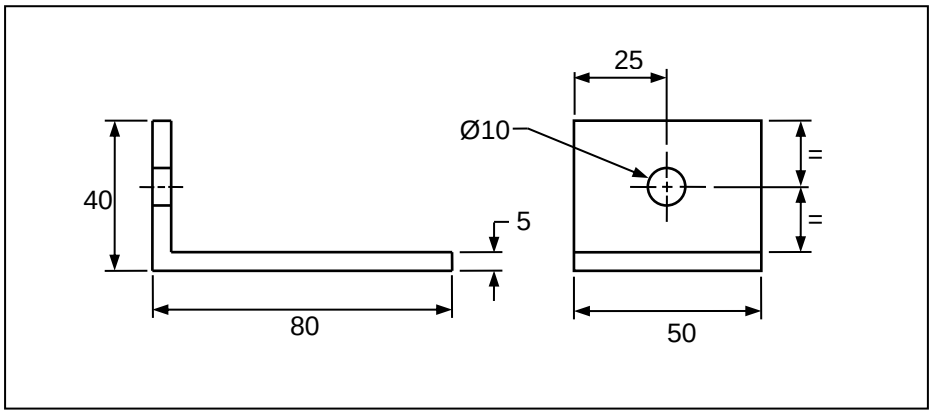
Any three of the following answers were accepted:

- weight
- cost
- strength
- heat or electrical conductivity
- will it be exposed to weather, heat, salt water, etc.

Some students answered with a general ‘properties of the material’ but without further elaboration.

Question 15

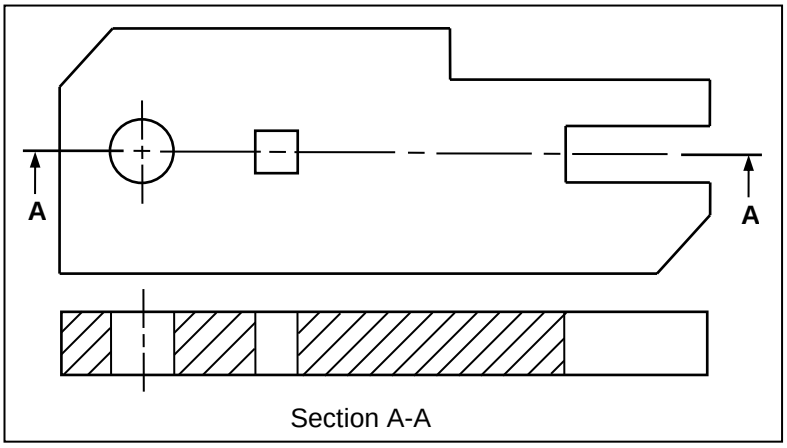
Marks	0	1	2	3	4	5	Average
%	13	10	14	33	22	9	**2.7**



Most students had difficulty drawing in correct third-angle projection and proper dimensioning.

Question 16

Marks	0	1	2	Average
%	78	17	5	**0.3**



Very few students demonstrated an understanding of sectional views.

Question 17

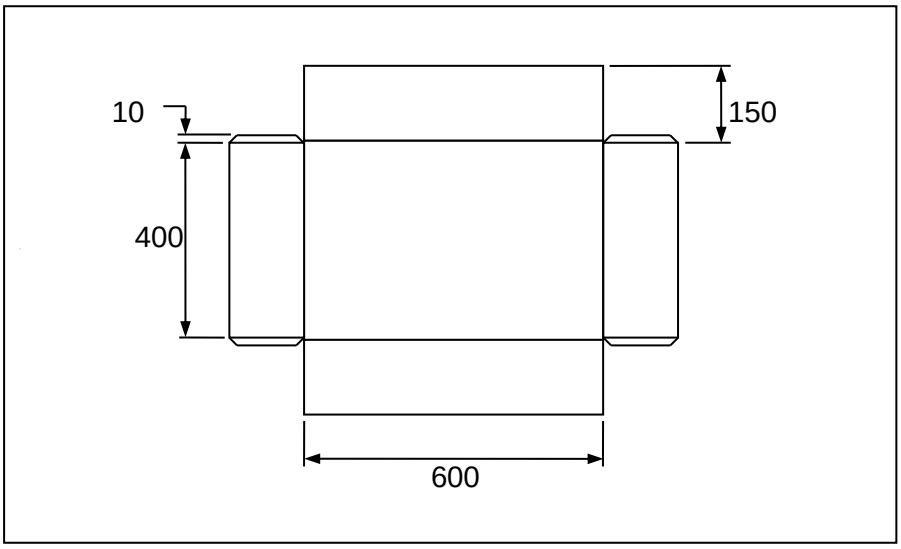
Marks	0	1	Average
%	15	85	**0.9**

It would be safe because the sling is rated at 3000 kg.

This question was answered well by most students.

Question 18a.

Marks	0	1	2	3	Average
%	21	10	40	29	**1.8**



Common errors included missing tabs and incorrect dimensions.

Question 18b.

Marks	0	1	2	Average
%	18	38	44	**1.3**

Any two of the following were accepted.

- pop rivets
- self-tapping screws
- screws and nuts

A common error was to include methods that did not use fasteners.

Question 18c.

Marks	0	1	Average
%	29	71	**0.7**

Answers between 500 and 510 were accepted.

This question was answered well by most students.

Question 18di and 18dii.

Marks	0	1	2	3	4	Average
%	35	21	25	14	5	**1.3**

Question 18di.

The following answers were accepted.

A: between 17.8 and 18.0

B: between 50 and 65, depending on the student design

Question 18dii.

Examples of typical designs:

- split pin with washer
- threaded end with locknut

The practicality of the design was considered when allocating marks. A typical example of poor design included a plain nut without any locking mechanism.

Question 18e.

Marks	0	1	Average
%	56	44	**0.5**

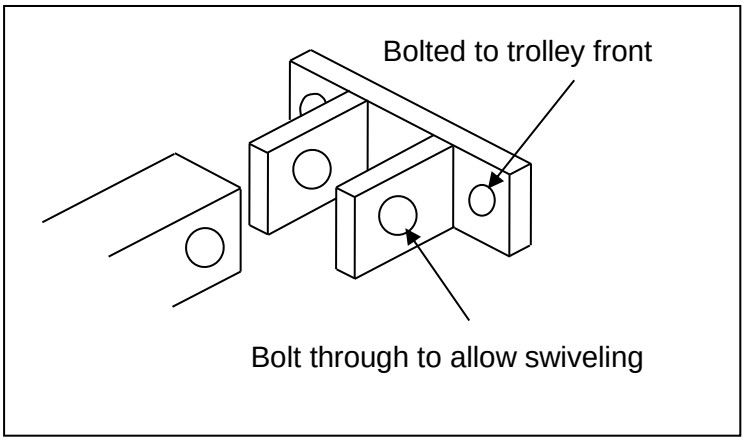
The best work holding method in this case is a four jaw chuck

Some students seemed to be on the right track, but had difficulty providing the correct name.

Question 18f.

Marks	0	1	2	3	4	Average
%	28	6	30	24	12	**1.9**

The following is a typical sample design:



Some students offered a reasonable design, but did not draw correctly or provide enough detail to gain full marks.

Question 19

Marks	0	1	2	3	Average
%	15	69	12	4	**1.1**

The specific purposes of the three tools is as follows.

- Reamer – finishing holes to an accurate size
- Drill – drilling holes from solid material (or enlarging holes)
- Boring bar – enlarging pre-existing holes

Most students correctly identified the purpose of the drill, but few could describe the purposes of the other two tools, particularly the boring bar.

Question 20a.

Marks	0	1	Average
%	50	50	**0.5**

Coat with marking blue or felt-tip pen.

Question 20b.

Marks	0	1	2	Average
%	17	51	32	**1.2**

Any four of the following answers were accepted:

- square
- scriber
- centre punch
- rule
- dividers
- protractor
- hammer
- vernier height gauge

The majority of students correctly listed two to three tools, but some students had difficulty with their correct names.

Question 21

Marks	0	1	2	3	4	Average
%	40	14	26	15	4	**1.3**

The work plan was to be completed as follows.

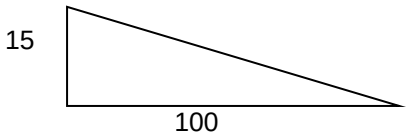
Step	Task	Machine	Tool
1	*Face off bar.*	*lathe*	*turning tool*
2	*Turn Ø 30 × 55 long.*	*lathe*	*turning tool*
3	Turn Ø 30 × 35 long.	lathe	turning tool
4	Cut M16 thread.	lathe	die or screw cutting tool
5	Part off.	lathe	parting tool

6	Face and chamfer.	lathe	turning tool
7	Mill slot.	milling machine	slitting saw

Operational planning is an important area for improvement. Students appeared to completely miss some steps in the process, and also seemed to have a very limited idea of the logical steps required.

Question 22

Marks	0	1	2	3	Average
%	61	14	4	21	**0.9**



$X = \tan^{-1} (15 / 100) = 8.53^{o}$

Most students attempted the question but were not able to correctly identify the basic triangle within the sketch.

Question 23a.

Marks	0	1	2	Average
%	50	7	44	**0.9**

Y = cos 140 / 260

Y = cos 0.5385

$Y = 57.4^{o}$

This question was attempted by most students.

Question 23b.

Marks	0	1	2	3	Average
%	59	9	13	19	**0.9**

$H = \sqrt{260^2 - 140^2}$

H = √67 600 - 19 600

H = √48 000

H = **219**

L = 320 + 140 + 140 = **600**

Answer: 600 × 219

The majority of students calculated ‘L’ correctly, but had difficulty with using Pythagoras’ Theorem to calculate ‘H’.

Question 23c.

Marks	0	1	Average
%	41	59	**0.6**

Methods that can be used are plastic welding or using adhesives.

Most students answered this question correctly, but some did not attempt it or misread the question and named a mechanical fastener.

Question 24a.

Marks	0	1	2	Average
%	36	23	41	**1.1**

3 × 800 = 2.4 m

8 × 400 = 3.2 m

Area = 2.4 × 3.2 = 7.68 m^2

Students generally calculated the floor space correctly.

Question 24b.

Marks	0	1	2	Average
%	56	7	37	**0.8**

1 bin = 0.4 × 0.8 × 0.6 = 0.192 m^3

3 / 0.192 = 15.6 (15 or 16 bins were accepted)

Most students had difficulty calculating volume.

Question 24c.

Marks	0	1	Average
%	12	88	**0.9**

The symbol indicates that a material is recyclable (or similar)

This question was answered correctly by the majority of students.

Question 25a.

Marks	0	1	2	3	Average
%	42	29	12	17	**1.1**

2 × 1100 = 2.2

5 × 400 = 2.0

4 × 650 = 2.6

2 pieces × 1100 = 2.2

5 pieces × 400 = 2.0

4 pieces × 650 = 2.6

Total = 6.8 m

While most students attempted this question relatively few gained the full marks. Basic errors were made such as missing a piece or not allowing for the 25 mm width of the tubing. Full marks were also allocated to students who allowed for mitering the corners of the top frame.

Question 25b.

Marks	0	1	Average
%	49	51	**0.5**

A suitable type of material would be stainless steel, because it will not rust and is suitable for food.

Question 25c.

Marks	0	1	Average
%	85	15	**0.2**

325 / 13 = 25 mm

Most students did not calculate this correctly. Most divided by the number of holes rather than the number of spaces.

Question 25d.

Marks	0	1	Average
%	38	62	**0.6**

To ensure that the drill does not damage the base of the vice, the rail should be placed on parallel strips or a block of wood.

This question was answered well by most students.

Question 25e.

Marks	0	1	2	Average
%	31	5	64	**1.3**

The RPM is calculated as follows.

(320 × 35) / 7.5

11 200 / 7.5 = 1493 RPM

This question was answered well by most students.

Question 25f.

Marks	0	1	2	Average
%	50	33	17	**0.7**

Adjustment: adjust work rest as wheel wears

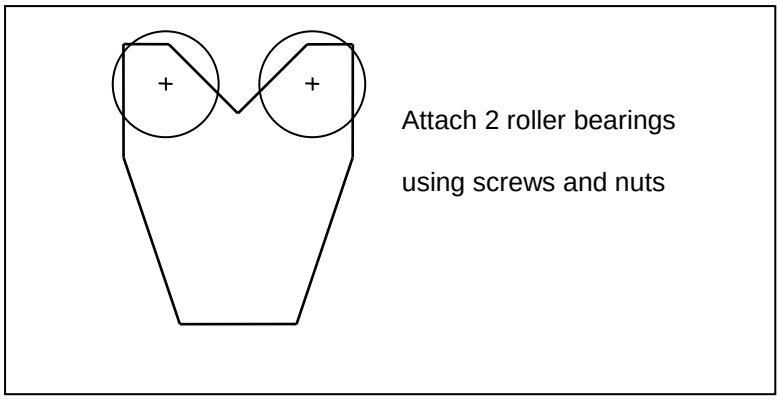
Maintenance: dress wheel as required (replacement of wheel also accepted)

Most students seemed unsure of the requirements.

Question 25g.

Marks	0	1	2	3	Average
%	37	47	11	5	**0.9**

The following is typical of the designs accepted.



Most students simply rounded off the bottom of the vee on the support bracket, which is not suitable for eliminating wear.

Question 25h.

Marks	0	1	2	Average
%	60	12	28	**0.7**

1 sheet = 1.2 × 2.4 = 2.88 m^2

2.88 × 12.1 kg = 34.848 kg

34.848 × 5 sheets = 174.24 kg

Most multiplied 5 sheets by the weight / kg/m^2 information taken directly from the table without first using the information in the table to calculate the weight of each sheet, given its dimensions.

Question 25i.

Marks	0	1	Average
%	23	77	**0.8**

One safe way to move the sheet metal is for two people to lift it, wearing gloves.

This question was answered well by most students.