VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2006 VCE VET Engineering Studies Certificate II GA 2: Written examination

GENERAL COMMENTS

In 2006 the scored VCE VET program Certificate II in Engineering Studies commenced in Victoria. The examination was based on the following Units of Competence:

- VBN771 Apply electrotechnology principles in an engineering environment
- VBN773 Produce engineering sketches and drawings
- VBN776 Using basic engineering concepts to plan the manufacture of engineering components
- VBN777 Handle engineering materials in a safe and proper manner
- VBN778 Produce basic engineering components using fabrication and machining techniques.

The examination paper was divided into five sections, one for each Unit of Competence. Mathematical applications were incorporated into many of the questions.

The examination contained a variety of question types, including multiple-choice, short answer and those requiring drawings, sketching and calculations. To gain full marks for questions requiring a calculation students needed to give the correct answer and the correct units.

Some students showed a limited understanding of basic engineering components and industry skills. In Units 3 and 4, students should be confident in applying these basic skills in assessment tasks. In general, most students demonstrated a good understanding of the underpinning knowledge and skills required to complete the required tasks.

SPECIFIC INFORMATION

Section A – VBN 771 Apply electrotechnology principles in an engineering environment

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D
1	10	4	9	77
2	10	8	81	1
3	64	4	6	26
4	6	8	73	14
5	16	9	8	68
6	18	4	6	72
7	43	14	18	26
8	19	12	62	7
9	6	48	24	22
10	2	10	14	74
11	83	4	8	5
12	47	20	17	16
13	9	51	32	8
14	55	38	1	6
15	11	61	21	6

Section B – VBN773 Produce engineering sketches and drawings

Question 1

Marks	0	1	2	3	4	Average
%	12	33	14	19	23	**2.1**

Marks were allocated as follows:

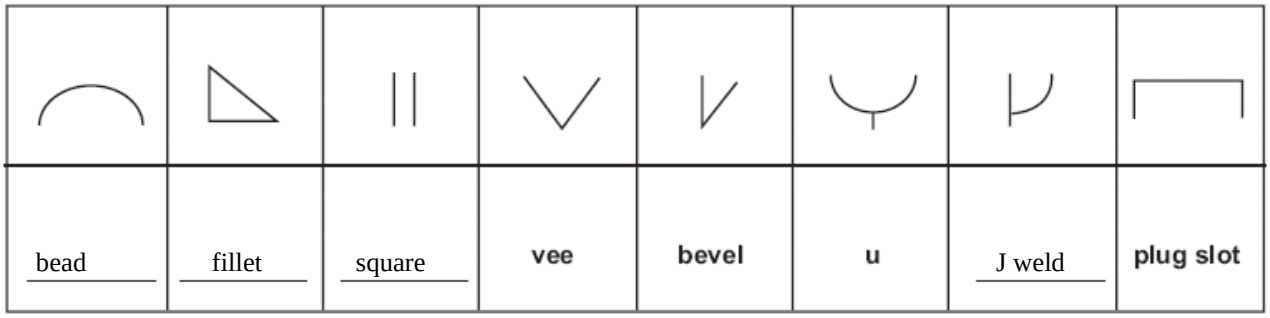
- one mark for an appropriate sketch. The hole could be going in from the end or across the shaft
- one mark for the dimension line. Dimensions that included limit lines were acceptable

- one mark for the centre line
- one mark for the hidden line.

The question instructed students that they **must** label each line; however, many students did not read the question properly and failed to label and clearly identify each type of line. These students could not be awarded full marks.

Question 2

Marks	0	1	2	3	4	Average
%	3	14	39	0	44	**2.7**



This question was not answered as well as expected. Students who had a good exposure to common welding symbols should have been able to determine what these symbols were.

Question 3

Marks	0	1	2	3	4	5	Average
%	5	1	5	27	61	1	**3.4**

Marks were awarded as follows:

- one mark for sectioning the base (drill holes in the base were optional)
- one mark for sectioning the adjusting arm (the sectioning needed to be 90° or opposite to the base)
- one mark for drawing the assembled adjusting arm
- one mark for locating and drawing the locking screw and washer
- one mark for locating and drawing the striker pin.

Generally this question was answered well, with the majority of students displaying good sketching skills; however, the final mark for a fully sectioned front view was not obtained by many students. Students need to ensure that they follow the instructions given in the question.

Question 4

Marks	0	1	2	Average
%	8	6	86	**1.8**

- Top view: F
- Pictorial view: O

This was a very well answered question, with students demonstrating an excellent understanding of third-angle projection interpretation.

Section C – VBN776 Using basic engineering concepts to plan the manufacture of engineering components

Questions 1–2

Marks	0	1	2	Average
%	15	35	50	**1.4**

Question 1

Mild steel

Many students used M.S. as an abbreviation for mild steel as listed on the material list. This was merely copying from the list provided and did not clearly demonstrate the full classification of the steel, therefore it was not awarded the mark.

Question 2
Cap screws or umbrako cap screws

Umbrako on its own was not accepted. Some students only answered 'screw', which did not demonstrate the difference between item number one and number nine, the cap screws. Full details were required to demonstrate competency.

Question 3

Marks	0	1	2	3	4	5	6	Average
%	4	4	5	8	25	27	27	**4.4**

Op. No.	Operation Description	Type of Machine	Work Holding Method	Equipment	Type of Cutter
1	**Check size**	NA*	Hand	Steel rule	NA*
2	**Clean and debur**	NA*	Held in hand or vice	• Any cleaning method • File or deburring tool	NA*
3	**Mark out fixed jaw basic outline**	NA*	• Marking out table • Work bench	Any one/ combination of: • scriber • rule • vernier height gauge • square • odd leg callipers • surface gauge.	NA*
4	**Set up machine vice and then mill jaw ends, and steps**	Any type of milling machine	Vice or clamp	• Dial indicator **and** indicator strips • Parallel strips	Any milling cutter was acceptable.
5	**Mark out the drilled and tapped holes, and counter bore holes**	NA*	• Marking out table • Work bench	Centre punch **and** any one/combination of: • scriber • rule • vernier height gauge • square • odd leg callipers • surface gauge.	NA*
6	**Drill and counter bore holes**	Drilling machine (any type)	Vice or clamp/ restraining mechanism	• Safety equipment • PPE	• Twist drill • Counter bore
7	**Tap holes**	NA*	Vice/bench vice	• Tap wrench • Cutting lubricant	Tap
8	**Finish**	NA*	Hand or vice	• File • Emery cloth	NA*

*NA= Not applicable

Overall, most students made a good attempt at this question. In order to receive the mark for line 4, 'lathe' was not accepted as the type of machine and 'dial indicator' was needed as part of the equipment. Any reasonable response was accepted as appropriate equipment for line 6.

Question 4

Marks	0	1	Average
%	31	69	**0.7**

Either of:

- maximum to minimum allowable/permissible error
- limits
- top size, bottom size.

Over two thirds of the students had a very good understanding of the term tolerance used on engineering drawings.

Question 5

Marks	0	1	2	3	4	Average
%	18	14	20	20	28	**2.3**

Op. No.	Operation Description	Type of Machine	Work Holding Method	Equipment	Type of Cutter
1	**Check size**	NA*	Hand	Steel rule	NA*
2	**Clean and debur**	NA*	Vice	File	NA*
3	**Face and centre drill** **Drill centre hole**	Lathe	Chuck or collet		Turning tool and centre drill
4	**Turn outside diameter 25.06 of the screwed bush**	Lathe	Chuck or collet	Micrometer or vernier	Turning tool
5	**Tap internal thread**	Lathe	Chuck or collet	• Tap wrench or floating holder • Cutting lubricant	Tap
6	**Turn 32 diameter**	Lathe	Chuck or collet	Micrometer or vernier	Turning tool
7	**Finish/Debur**	NA*	NA*	Emery file cloth	NA*

* NA= not applicable

Key words such as ‘centre drills’, ‘micrometers’ and ‘vernier callipers’ were missing on many papers. Generally, this question was answered well.

Question 6

Marks	0	1	2	Average
%	19	14	67	**1.5**

Two specific examples were needed, such as safety glasses and shoes. Other reasonable OH&S considerations were also accepted, including appropriate clothing. PPE was not accepted.

Section D – VBN777 Handle engineering materials in a safe and proper manner

Question 1

Marks	0	1	2	Average
%	1	8	91	**1.9**

- deburr
- gloves

Any reasonable response was accepted. Students showed an excellent understanding of OH&S principles.

Question 2

Marks	0	1	2	Average
%	3	26	72	**1.7**

Any of:

- reinforced toe protection
- steel caps
- made of leather
- toughened material
- solid construction.

Safety footwear was well understood by students.

Questions 3–5

Marks	0	1	2	3	Average
%	14	19	39	28	**1.8**

Question 3

You

Question 4

Personal Protective Equipment

Question 5

MSDS or Material Safety Data Sheets

Question 6

Marks	0	1	2	Average
%	2	6	93	**1.9**

Any two of:

- trolley
- crane
- fork lift.

Other reasonable responses were also accepted. Students showed an excellent understanding of this area.

Questions 7–8

Marks	0	1	2	Average
%	17	38	45	**1.3**

Question 7

Either of:

- trial/test lift
- assessment of the object.

Question 8

Safe working load

Question 9

Marks	0	1	2	Average
%	23	43	33	**1.1**

Because of the danger of:

- bodily injuries
- flying components.

Only one third of students fully understood this question; however, most students gained at least one mark. Compressed air is very common in the industry but limited in schools' workshops. Teachers need to understand that students should have an adequate understanding of its dangers.

Question 10

Marks	0	1	2	Average
%	6	20	74	**1.7**

10i.
Electrical hazard

10ii.
Toxic materials/chemicals

Three quarters of the students answered correctly, with most of the others gaining one mark. An excellent understanding of safety warning signs was shown when answering this question.

Section E – VBN778 Produce basic engineering components using fabrication and machining techniques

Question 1

Marks	0	1	2	3	4	5	Average
%	9	14	24	39	13	1	**2.4**

- A – arbor/spindle
- B – machine column/column
- C – table milling table
- D – table hand feed wheel
- E – controls electrical controls

Many responses seemed to indicate that students had not undertaken enough theory on major milling machine parts. It was also a concern that some students showed a poor understanding of basic machine parts.

Questions 2a–b.

Marks	0	1	2	Average
%	43	40	17	**0.8**

Question 2a.
Right hand turning tool

HSS and general turning tool were not accepted.

Question 2b.
Either of:

- general turning
- cutting from left to right.

Questions 3–4

Marks	0	1	2	Average
%	38	34	28	**0.9**

Question 3
Either of:

- longer tool life
- rapid metal removal.

Question 4
Straight/parallel shank twist drill

These questions were not well answered and it appeared that students lacked the knowledge needed.

Question 5

Marks	0	1	2	Average
%	25	36	38	**1.2**

Either of:

- 'T' slots and clamp
- 'V' block and clamp.

One mark was awarded for clamp and the other mark for 'V' block or 'T' slot. Various levels of understanding were shown by students. Teachers should ensure that they follow textbook directions when teaching this material.

Question 6

Marks	0	1	Average
%	86	14	**0.2**

To remove drills or drill sleeves

This is a basic engineering tool used every day in the workshop; however, most students did not know its use. The drill drift is used to separate drills used on tapered shank drills and drill sleeves (Morse taper) on lathes and drilling machines.

Question 7

Marks	0	1	2	Average
%	89	10	1	**0.1**

7i.
Helical slab mill

Slab mill was also accepted.

7ii.
Shell end mill

End mill was also accepted.

Question 7 returned the poorest response in the entire exam, with very limited understanding demonstrated of the cutters shown, despite the clear pictures that were provided on the paper.

Question 8

Marks	0	1	2	Average
%	5	20	75	**1.7**

Any two of:

- safety rest clearance/steady rest clearance
- check for damaged wheel cracks
- safety glasses
- guarding/wheel guards.

There were many other possible answers, and any reasonable response was accepted. This question was well answered overall.

Question 9

Marks	0	1	2	Average
%	42	5	53	**1.2**

A live centre rotates and a dead centre is stationary.

Half of the students demonstrated a good understanding; however, many students did not attempt the question. This could be due to their own workshop tooling.

Question 10

Marks	0	1	2	Average
%	60	6	33	**0.8**

55.20 mm

55.2 was also accepted. Many students had difficulty understanding the basic vernier reading skills needed to answer this question.

Question 11

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

23.99 mm

23.98 mm was also accepted. One mark was awarded for the reading and one mark for the correct units.

Question 12

Marks	0	1	2	Average
%	22	3	75	**1.5**

To protect the work piece/to hold irregular profiles.

This was well understood by students.

Question 13

Marks	0	1	2	3	4	Average
%	8	14	25	29	25	**2.5**

13i.

- boat
- thermal joining of materials.

13ii.

Sheet type materials no screw threads; for example, motor car, washing machine, refrigerator or sheet metal panels

13iii.

- putting in bearing nuts and bolts
- retention

13iv.

Joining any components

A wide range of answers was acceptable for Question 13.

Question 14

Marks	0	1	2	Average
%	50	5	45	**1.0**

A surface from which all other measurements are taken. Starting point, reference point or zero point – where other dimensions are measured from.

Only half of the students understood this basic rule on engineering drawings.

Question 15

Marks	0	1	Average
%	37	63	**0.6**

662 rpm

Two thirds of the students displayed good mathematical skills and completed this question with the given formula. It was necessary to show all working.

Question 16

Marks	0	1	Average
%	75	25	**0.3**

1200–1300 rpm

Three quarters of students showed no understanding of this basic cutting speed nomogram. Frequent use of a nomogram in the workshop is essential, and students should gain adequate experience to be able to transfer this knowledge to an examination setting.

Question 17

Marks	0	1	Average
%	64	36	**0.4**

Machining or machine finish

This question required a higher level of understanding and generally was not well answered, possibly due to limited understanding and use in the workshop.

Question 18

Marks	0	1	2	Average
%	13	46	41	**1.3**

Question 18a.

Any of:

- slips
- dermatitis
- falls
- infections.

Question 18b.

Cuts

Question 19

Marks	0	1	2	Average
%	3	9	87	**1.9**

Aluminium

- aircraft
- boat windows

Stainless steel

- sinks
- cooking utensils
- stove tops
- screws
- items that need to be rust proof.

A variety of responses was accepted, and some excellent answers were given.

Questions 20–21

Marks	0	1	2	3	Average
%	9	15	31	45	**2.1**

Question 20

That the power cord is not damaged/tool is not damaged.

Question 21
Any two of:

- type of material
- thickness of material
- diameter of pop rivet.