2008 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2008 VCE VET Electrotechnology GA 2: Examination

SPECIFIC INFORMATION

Section A – Multiple-choice questions

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

Question	% A	% B	% C	% D	% No Answer	Comments
1	55	13	25	8	0	
2	9	42	35	15	0	Students showed a lack of knowledge about protection devices used in circuits and the way they operate.
3	4	1	3	92	0	
4	16	27	52	5	0	Students displayed a lack of knowledge of cell voltages.
5	30	23	42	5	0	
6	15	66	11	7	1	
7	8	60	24	8	0	
8	46	35	17	1	0	
9	37	33	4	26	0	
10	7	36	35	22	0	
11	87	7	1	5	0	
12	1	9	1	88	0	
13	15	24	55	5	1	
14	30	23	35	12	0	
15	5	6	3	86	0	
16	19	72	1	8	1	
17	11	10	62	17	0	
18	17	47	30	6	0	
19	25	14	52	9	0	The term 'CMOS' (option C) is commonly used in the computer world. Students are likely to choose CMOS when they are not sure of the correct answer.
20	25	14	56	5	0	

Section B

Question 1

Question 1a.

Marks	0	1	2	3	4	Average
%	7	9	24	19	41	**2.8**

The following were accepted as correct responses. Key words shown in bold were also given full marks.

Dangers of lead-acid batteries	Precaution
Acid **burn**	Personal protective equipment, **PPE**
Explosion from hydrogen gas	**Ventilation**, visual inspection
Injury when **lifting** (heavy)	Safe **lifting** or lifting aid
Fire or sparks from **short circuit**	Keep tools and terminals insulated, keep **fire extinguisher** nearby
Gas leakage	Ventilated room
Acid leakage	PPE, wear **gloves**

Students needed to correctly identify the danger associated with using lead-acid batteries and the precaution used to avoid the identified danger. One mark each was awarded to the danger and its precaution. If the danger and precaution were unrelated, the mark was awarded only to the correct danger identified.

Students correctly identified the dangers, but there seemed to be a misunderstanding between the concepts of 'precaution' and 'immediate corrective action'.

Question 1b-c.

Marks	0	1	2	3	4	Average
%	8	23	37	20	12	**2.1**

6V/1.2 = 5

Students were expected to know the voltage for an Ni-Cd cell and use it in calculating the number of cells required.

The response was generally good, however most students assumed the wrong cell voltage of 1.5V.

If incorrect cell voltage was assumed but correctly calculated, one mark was awarded.

Teachers and students are advised to learn the cell voltage of commonly used cells and how to calculate the number of cells used for any application by practising different required voltages.

Question 1c.

Any of:

- **rechargeable**
- **higher current** capacity
- holds voltage for length of discharge
- less likely to **leak**
- lasts longer, long-life
- **steady voltage**
- **cheaper** in the long run.

Students were awarded two marks when they gave two acceptable reasons for using an Ni-MH battery. One mark was awarded for each correct answer. Any key word (shown in bold above) was awarded full marks. Where students gave general reasons such as 'small', no marks were given.

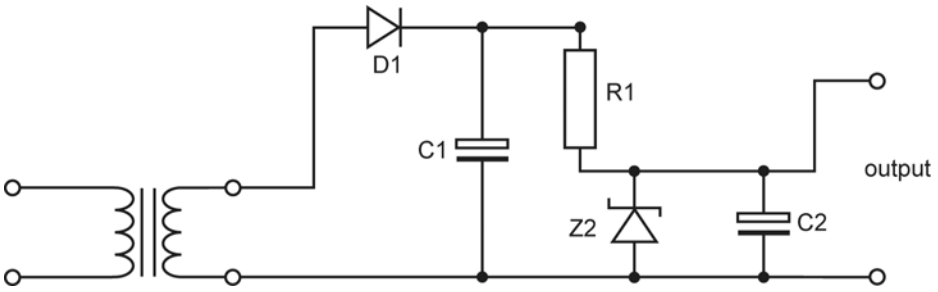
Many people use MP3 players and the advantages of using a particular type of battery should be understood.

Students are expected to learn why certain batteries are preferred for some common applications.

Question 2

Question 2a.

Marks	0	1	2	3	4	5	Average
%	14	1	1	2	8	75	**4.2**



Students were expected to understand how various components were connected from the layout diagram given and draw the schematic diagram. Each of the five components correctly connected was awarded one mark. Most students responded correctly.

Question 2b-c.

Marks	0	1	2	Average
%	35	31	35	**1**

2b.

Any of:

- D_1 is a rectifier
- D_1 acts like a switch
- passes current/voltage in one direction
- blocks current/voltage in one direction
- forces capacitor to discharge through R_1
- prevents discharge through mains.

'To protect the circuit' was not an acceptable response.

Most students answered this question correctly, however it appeared that some students did not understand the word 'function'.

Students must understand the concept of the rectification function of diodes and how diodes can be connected differently to achieve different ways of rectification.

2c.

Students were awarded one mark for identifying the component Z_1 as a Zener Diode.

Most students were able to identify the component correctly. Some incorrect responses, such as 'Diode', were observed.

Question 2d.

Marks	0	1	Average
%	46	54	**0.6**

Any of:

- C_1 acts as a filter
- smoothes out the pulsating DC
- reduces AC ripple
- stores charge.

Most responses were correct.

Question 2e.

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

Any one of the following (or keywords) was awarded a mark.

C_1 will **overheat**	Likely to **explode**
C_1 will not function as a capacitor	**Circuit will not function**
May **not get the correct** output **voltage**	C_1 will not charge
Change/reduction in current through R_1 and/or Z_1	

It appeared that most students did not understand that the question related to the circuit shown and many general responses were received. The marking criteria was extended to include all general correct responses as the question did not specify (although it was understood) that all questions must be answered with respect to the figure shown.

Students must understand the context of the question to ensure they provide the correct responses.

Question 3
Question 3a.

Marks	0	1	2	Average
%	53	11	36	**0.9**

Formula to use: $1/RT = 1/R_1 + 1/R_2 + 1/R_3$

$1/RT = 1/5K + 1/5K + 1/10K$

RT = 2K Ohms

Full marks were awarded for the correct answer with units included. If the unit was omitted but the right calculations were used, one mark was awarded.

The question was answered well by most students, however there was some confusion resulting from a lack of understanding in transposing or applying formula.

More attention is needed in calculating total resistance values for series and parallel resistance circuits.

Question 3b.

Marks	0	1	2	Average
%	44	13	43	**1**

$I_s = V_s/RT$; $I_s = 100V/2K = 50mA$ or $0.05A$

The correct answer with units included was given two marks. Answers with no units included were awarded one mark.

If the incorrect answer in Question 3a. was used but the calculation was done correctly and the answer was displayed with units, full marks were awarded. No marks were awarded if the incorrect answer was used but no units were given.

Some students used $I_s = RT/V_s$; this showed that these students lacked basic knowledge.

A lot of practice is needed for calculating R, I and V at various points of a circuit.

Questions 3c-d.

Marks	0	1	2	Average
%	46	37	17	**0.7**

3c.
The voltage across R_3 does not change.

Correct responses included: No change, 100V, etc.

Most students responded correctly. This showed that the students knew what happened to the voltage across R_3 but lacked knowledge in doing calculations, as evidenced in Questions 3a. and 3b.

Students are encouraged to practise the effects of open and short circuits of components in a circuit.

3d.
Point F

This question was poorly or ambiguously answered by most students. Most responses specified two points, for example B–F, which was not given any marks. This indicated that many students do not know that in order to measure the current through a resistor, an ammeter needs to be introduced in series with the resistor. Some students indicated two points instead of one, which showed confusion with the way voltage is measured.

Students need to know that the ammeter used to measure current is introduced in series and that the voltmeter to measure voltage is introduced in parallel.

Question 3e.

Marks	0	1	2	Average
%	36	14	50	**1.2**

A circuit breaker is introduced in series as it activates on current.

Either of:

- point A or A
- point D or D.

Responses of 'A–D' were not accepted.

In general, all test and protection instruments or gadgets related to current are put in series in a circuit.

Question 4

Marks	0	1	2	3	4	5	Average
%	47	22	21	7	2	1	**1**

One mark each was awarded for the correctly named transducer.

Sound to electrical	Microphone or loudspeaker or ultrasonic detector
Temperature to electrical	Thermistor or Thermocouple
Pressure to electrical	Crystal or Piezo
Weight to electrical	Strain gauge, **weight transducer** (not accepted)
Magnetic flux density to electrical	Hall effect sensor, generator, alternator, transformer, **electric motor** (not accepted)

Students needed to give the **name of the transducer**, **not** the name of the application which uses the transducer.

Student responses for this question were very poor as it appeared that students did not understand the question. The responses indicated that students believed they had to indicate the way energy is converted from one form to another, instead of generating an electrical signal proportional with the magnitude of the energy required to be measured.

Students should be taught more clearly about the name of the transducer and applications where transducers are used.

Question 5
Question 5a.

Marks	0	1	2	3	4	5	Average
%	13	6	8	28	26	20	**3.1**

The flowchart referred to a 'water inlet valve' that was not shown in the diagram. A range of answers were considered appropriate.

If a sequence was detected full marks were given. Otherwise each step was awarded one mark.

Sequential steps:

1. When the cistern is flushed, the pump is turned on.
2. Check to see if the filter is clogged (the question stated that the filter was not clogged so it was not vital that this step was included)
3. The pump will continue to operate until the cistern is filled or until the toilet pressure sensor is high. (treated as one statement)
4. The pump is turned off.
5. The water tank level sensor is read. (The question stated that the water inlet was connected to the tank but some students also included this as a step in the sequence. One mark was awarded if this statement was also included)
6. Check to see if the toilet flushes, and if it does, repeat from step 1. If it does not flush, repeat step 6.

In general most students were able to read and understand the flowcharts, however students were not able to see that the flowchart related to a functional circuit. Some responses showed that they did not relate the flowchart to a working system.

Teachers must ensure that students can interpret flowcharts correctly and know how they can be converted to sequential steps in point form.

Question 5b.

Marks	0	1	2	Average
%	25	53	22	**1**

The following two steps were awarded one mark each.

1. **Unclog** the filter, replace the filter or clean the filter
2. **Reset the system or power** by turning it off, then on

It appeared that most students did not understand what to do after 'stop' is encountered in a flowchart. Only a few students included 'reset the system' in their response.

Students are encouraged to practise interpreting flowcharts more often.

Question 5c.

Marks	0	1	2	3	Average
%	9	18	38	36	**2**

The question did not state clearly that the processor was working and the input and output signals were correct. It appeared that most students assumed there was problem with the sensor and different responses were accepted.

5ci.

Effect on the system was awarded one mark.

- the water pressure to the cistern will remain high
- excessive load or wear on the pump
- the water tank will overflow
- the pump can fail
- the system will not function
- the system may have to be shut down.

5cii.

Students were awarded two marks when they suggested two ways to fix the system.

- a hardware timer could be incorporated into the system to turn off the pump if it continues to run for a predetermined amount of time
- incorporate a pump overrun alarm
- the system could then be manually switched off and set to mains
- the water pressure sensor is replaced (this has been assumed)
- change the program (software solution) or software timer.

Question 6

Question 6a.

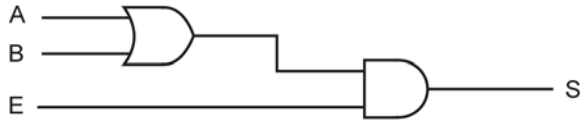
Marks	0	1	2	3	4	5	6	Average
%	7	1	5	9	9	18	51	**4.7**

E	A	B	S
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

Each row with all correct entries was awarded one mark. Most students answered correctly and the response was good.

Question 6b.

Marks	0	1	2	Average
%	45	15	40	**1**



Each correct symbol and position was awarded one mark each. Symbols needed to be in the right place. Where the order was reversed, no mark was awarded.

A good number of students responded correctly. Some students appeared to be unsure about the symbols. Students need to concentrate on using the basic logic symbols correctly.

Question 6c.

Marks	0	1	2	Average
%	77	4	19	**0.5**

S = E .(A + B) or S = (A + B) . E

A correctly written Boolean equation was awarded two marks.

The majority of students did not give the correct response. Boolean equation is an important topic in digital circuit simplification and students should spend more time mastering this.

Question 7
Question 7a.

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

Star topology

Students need to understand the basic topologies in networking.

Question 7b.

Marks	0	1	Average
%	63	37	**0.4**

Cat 5 cable or twisted pair cable

No mark was awarded for Internet cable, USB, fibre optics, etc.

Question 7c.

Marks	0	1	2	Average
%	35	37	28	**1**

A network interface card (NIC) **enables the device to communicate** with other devices on the network.

Any one or a combination of the following was awarded one mark:

- all devices
- printer
- workstation
- computer
- laptop
- router.

As the question did not specify the number of devices, a correct equipment name was given one mark. A correct definition of NIC was given one mark.

Question 7d.

Marks	0	1	Average
%	25	75	**0.8**

Any of:

- easily share files
- share printer
- share outside connection to Internet, email, or outside world
- control over network use
- share software
- share resources
- share drives.

Question 8

Question 8a.

Marks	0	1	2	Average
%	34	8	59	**1.3**

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
SOH	0	3	5	9	W	EOT
01 or 1	30 or 4F or 6F	33	35	39	57	04 or 4

Students were required to correctly read the chart. As there could have been confusion regarding Byte 2, which could have been interpreted as the letter 'O' or 'o', full marks were awarded for both of these interpretations. Two marks were given where all responses were correct. One mark was given where students gave up to three incorrect responses. No marks were given where more than three answers were incorrect.

Some students had the higher nibble and lower nibble reversed and lost marks.

Students are advised to practise ASCII chart reading correctly.

Question 8b.

Marks	0	1	2	Average
%	50	3	48	**1**

1 or 0000001 or 00000001 (Prefix 0s did not matter)

Question 8c.

Marks	0	1	2	3	Average
%	55	3	3	39	**1.3**

0011 0101 1001

One mark was awarded for each correct nibble (had to be 4 bit each).

Question 9

Question 9a.

Marks	0	1	2	Average
%	57	3	40	**0.9**

Any one of the following was given full marks:

- 12 volts p-p, 12V, or 12 as per volts/div
- 4cm, and hence 8V.

This question specified scale as 2V/cm where it should have been 2V/division. Students who measured the length and calculated voltage were also given full marks. Peak to peak voltage was given two marks.

Most students were able to correctly read the graphs.

Question 9b.

Marks	0	1	2	3	Average
%	61	16	6	17	**0.8**

period, T = 7 * 0.5 ms = 3.5mS

F = 1/T

Frequency = 286 Hz (Range 285.5 to 286.5 Hz)

Full marks were given for calculating the correct frequency with units included. The correct period was awarded one mark. One mark was awarded for calculating the frequency from the time period with no units specified.

It appeared that most students could not read the time base and could not calculate the time period. This could be from a lack of knowledge of finding out the period of a waveform.

Practical work in determining period and frequency by reading from graphs and measurements is recommended.

Question 9c.

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

Peak to peak voltage from signal generator.

Any of:

- divide 12 volts by 100
- 120mV or 0.12V or 0.12.

Most students did not respond correctly. This could be due to a lack of knowledge about amplifier function.

Students should understand clearly the basic function of an amplifier and the effect of amplification on voltage and current.

Question 9d.

Marks	0	1	Average
%	82	18	**0.2**

Period from signal generator.

3.5mS (frequency does not change when signal amplified).

. Some students wrongly divided the frequency by 100 as well.

Students need to understand the basic function of an amplifier and the effect of amplification on voltage and current and frequency.

Question 10
Question 10a.

Marks	0	1	2	Average
%	43	24	32	**0.9**

Time Constant = C x R = 1000uF x 1K = 1 second

Full marks were awarded for an answer with units included. Where correct values were used in the formula but the answer was incorrect, students were awarded one mark.

Students who did not answer the question correctly may have had difficulty multiplying values in engineering notation.

Students must practise working out time for calculating time constants.

Question 10b.

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

Five seconds

It takes five time constants to fully charge. Students needed to know that it is necessary to multiply a time constant by five.

Question 10c.

Marks	0	1	2	Average
%	25	3	71	**1.5**

One of:

- the **capacitor discharges** through the lamp
- the **lamp will flash** brightly for a very short period of time, giving the flash effect
- capacitor charges will equalise
- **no current is drawn** from the source/supply.

Most students gave the correct response.

Question 11
Question 11a.

Marks	0	1	2	3	Average
%	72	13	2	14	**0.6**

After first clock-pulse	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
After third clock-pulse	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
After fifth clock-pulse	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**

No mark was awarded for reverse order. Each row needed to be fully correct to obtain one mark each. Few students attempted this question and very few got the correct answer.

Question 11b.

Marks	0	1	Average
%	67	33	**0.4**

8 clock pulses

Question 11c.

Marks	0	1	2	Average
%	45	22	33	**0.9**

Any two responses were given a mark each:

- USB
- modem
- mobile phone
- wireless broadband
- Firewire
- broadband (ADSL)
- digital TV
- printers
- serial port
- computer network
- monitor.