2023 VCE VET Integrated Technologies external assessment report

General comments

The 2023 VET Integrated Technologies examination consisted of two sections: Section A, which comprised 20 multiple-choice questions; and Section B, which comprised 13 questions that required students to provide a combination of written explanations and show working, and state the correct units of measurements for the given problems. Students were also required to complete artwork drawings of printed circuit boards and show an understanding of technologies and use of flow charts.

Students were required to use correct engineering prefixes. It was apparent that many students needed to prepare for the examination by practising the application of Ohm’s law and how to consistently apply engineering prefixes.

In applying Ohm’s law calculations, students should follow the standard procedure. For example, in Question 5a., to determine the total resistance of the circuit, the procedure is:

Select the formula required for the desired outcome: I = V / R
Substitute the given values using base units: 0.5 A = 10 / RT

Transposing formula RT =10/0.5
Calculate the answer in base units: RT = 10/0.5 = 20Ω

The limited number of students who followed this methodology, or a similar approach, gained full marks for this question and would have gained full marks when this methodology was applied correctly in similar questions. It is highly recommended that students familiarise themselves with the standard table of electronic symbols as used in these examinations and published online by the VCAA.

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 of more or less than 100 percent.

Section A – Multiple-choice questions

Correct answers in the following table are in bold type with cell shading.

| Question | Correct answer | % A | % B | % C | % D | Comments |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | C | 0 | 0 | 100 | 0 |  |
| 2 | D | 17 | 33 | 0 | 50 |  |
| 3 | A | 33 | 50 | 17 | 0 | Potentiometers calculation |
| 4 | A | 50 | `17 | 17 | 17 | Sinusoidal signals calculation of frequency and riding of the peak of the signals amplitude. |
| 5 | D | 17 | 0 | 0 | 83 |  |
| 6 | C | 0 | 0 | 100 | 0 |  |
| 7 | D | 0 | 0 | 0 | 100 |  |
| 8 | B | 0 | 83 | 0 | 17 |  |
| 9 | C | 0 | 17 | 50 | 33 |  |
| 10 | C | 17 | 9 | 50 | 33 | This was poorly answered because to solve it the students must be aware that the internal resistance of a Voltmeter is infinity and that of an Ammeter is zero. Many tried to use formulas to answer it. |
| 11 | D | 0 | 0 | 0 | 100 |  |
| 12 | C | 17 | 0 | 83 | 0 |  |
| 13 | B | 0 | 100 | 0 | 0 |  |
| 14 | B | 0 | 67 | 17 | 17 |  |
| 15 | B | 0 | 100 | 0 | 0 |  |
| 16 | A | 100 | 0 | 0 | 0 |  |
| 17 | A | 83 | 0 | 17 | 0 |  |
| 18 | D | 17 | 17 | 33 | 33 | To answer the question students needed to know the acronym CAD. |
| 19 | D | 0 | 50 | 17 | 33 |  |
| 20 | A | 83 | 0 | 0 | 17 |  |

Section B

Question 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 0 | 9 | 9 | 18 | 9 | 9 | 45 | 4.4 |

Students were asked to name three components of electric circuits and provide a short description of their functions.

The first symbol was an LED and its main function is to signal the status of a system (e.g. ‘ON’).

The second symbol was a Single Pole Double Throw switch. Its main function is to redirect the electric current in a circuit.

The third symbol was an AC supply or generator. Its main function is to supply power or a signal to an electric circuit. Some students stated that this was an electric motor.

Question 2a.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 0 | 0 | 0 | 0 | 100 | 4.0 |

The students were asked to calculate the total resistance of an electric circuit. The answer is calculated in the following steps.

First: the equivalent resistance of the two 40 Ω resistors which is 20 Ω.

Second: the total resistance is the sum of the three 10 Ω and the 20 Ω resistances which is 50 Ω.

Question 2b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 17 | 0 | 83 | 1.7 |

Students were asked to calculate the total current of the circuit. The first step is to use Ohms law (V = R × I) to calculate the current in the circuit. The second step is to substitute the voltage of the supply and the total resistance in the formula. The calculated current is 2A. The question was answered satisfactorily by most students. Some students included the units in their answers.

Question 2c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 17 | 17 | 67 | 1.5 |

Students were asked to calculate the voltage displayed by the Voltmeter in Figure 1. The calculation consisted of multiplying the current in the circuit calculated in 2b. (2A) with the resistance of 10 Ω. The expected result is 20V. Some students included the units in their answers.

Question 2d.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 0 | 17 | 83 | 1.8 |

Students were asked to calculate the total power generated by the supply. The answer is found by multiplying the voltage of the supply with the current in the electric circuit: 100 × 2 = 200W

Some students specified the unit in their answers.

Question 3a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark  | 0 | 1 | Average |
| % | 17 | 83 | 0.8 |

Students were asked to specify the function of the circuit in Figure 2. The correct answer was an AC/DC rectifier.

Question 3b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | Average |
| % | 0 | 0 | 0 | 100 | 3.0 |

Students were asked to calculate the voltage across the secondary coil of the transformer.

The formula used was VP/VS= NP/NS. The result was 12V.

Question 3c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 67 | 0 | 33 | 0.7 |

Students were asked to calculate the peak voltage of the secondary coil of the transformer. The result is calculated by multiplying the RMS voltage of the secondary (12 V) by 1.41. Expected result 16.92 V. Rounding up to 17 V was accepted as correct.

Few students answered well. It seemed that this formula was not well known by students.

Question 4

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 0 | 0 | 0 | 0 | 100 | 4.0 |

Students were asked to design the PCB artwork of an electric circuit using a supplied layout artwork.

All the students answered well, reflecting a good understanding of the task.

Question 5a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 58 | 8 | 33 | 0.8 |

Students were asked to find a fault in an electric circuit.

Students were required to calculate the total resistance of the faulty circuit. Using Ohms law by dividing the supply voltage 10 V by the current of 0.5 A in the faulty circuit, the result is 20 Ω.

Few students answered well. The task requires a good understanding of the procedure of fault finding.

Question 5b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 0 | 8 | 42 | 0 | 50 | 2.9 |

RT=20Ω (=10V/0.2A)

5Ω+15Ω = 20Ω

R2 is faulty (as open circuit).

Question 6

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 17 | 0 | 0 | 8 | 75 | 3.3 |

Students were asked to draw missing dimension lines required to produce a part of a mechanism.

Most students answered well, showing an understanding of technical drawing.

Question 7a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark  | 0 | 1 | Average |
| % | 0 | 100 | 1.0 |

The students were asked to design a battery bank to provide 18 V.

To produce 18 VDC three batteries are required: 18 V / 6 V = 3

Question 7b.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark  | 0 | 1 | Average |
| % | 50 | 50 | 0.5 |

To increase the capacity of the battery bank, another three batteries are required in parallel.

Question 7c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 67 | 0 | 33 | 0.7 |

The correct answer is a set of three batteries in parallel with another three batteries.

Question 8a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | Average |
| % | 17 | 0 | 8 | 75 | 2.4 |

Students were asked to complete a table with the hardware used to increase or decrease the temperature, humidity and light in a greenhouse. The correct answers are given in the table below:

|  |  |  |
| --- | --- | --- |
| Environmental variable | Hardware used to decrease variable | Hardware used to increase variable |
| temperature | fan | heater |
| humidity  | dehumidifier  | water sprayer |
| light | light shutters | grow lamps |

Question 8b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | Average |
| % | 0 | 0 | 17 | 83 | 2.8 |

The students were asked to complete a table with the set points requested by the client.

|  |  |  |  |
| --- | --- | --- | --- |
| Set point variable | Set point | Lower limit | Upper limit |
| temperature | 21 0C | 19 0C | 23 0C |
| humidity  | 65% | 55% | 75% |
| light | 10 000 lux | 9000 lux | 11 000 lux |

Question 9a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark  | 0 | 1 | Average |
| % | 0 | 100 | 1.0 |

Students were asked to explain the use of a block diagram in the project planning phase. Possible correct answers: identifying hardware; visualizing interconnections

All students answered correctly.

Question 9bi.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | Average |
| % | 0 | 0 | 9 | 91 | 2.9 |

Students were asked to complete a block diagram of the greenhouse. Question 9a. required them to identify and label the blank blocks.

Most students answered well.

Question 9bii.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | Average |
| % | 0 | 0 | 9 | 91 | 2.9 |

Students were required to draw links between blocks and indicate direction of data flow.

Question 9c.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | 5 | Average |
| % | 0 | 0 | 9 | 18 | 18 | 55 | 4.2 |

Students were required to complete the steps of an action plan.

|  |  |
| --- | --- |
| Order | Action plan steps |
| 1 | Define the project goals and requirements. |
| 2 | Select and purchase equipment. |
| 3 | Design the control system. |
| 4 | Install and set up the control system. |
| 5 | Monitor and adjust the system. |
| 6 | Test and validate the system. |

Question 10a.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 0 | 11 | 0 | 22 | 67 | 3.4 |

The students were asked to identify the symbols used in flowcharts.

Most students answered well.

Question 10b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 11 | 0 | 0 | 67 | 22 | 2.9 |

Students were asked to complete a humidity control flowchart.

Question 11a.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 0 | 0 | 25 | 0 | 75 | 3.5 |

Students were asked to identify hazards and risk-control measures.

|  |  |  |
| --- | --- | --- |
| Activity | Hazards | Risk-control measures |
| using a computer for project planning | eye strain | good ergonomics |
| connecting pump to the power and control system | A | B |
| Installing grow lights to greenhouse roof | C | D |

Possible answers:

A: electric shock, burns, fire

B: train personnel, PPE, safety switches

Question 11b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | 3 | 4 | Average |
| % | 0 | 0 | 17 | 25 | 58 | 3.4 |

Students were asked to list two negative situations and provide mitigation strategies for them. Possible answers are listed below.

|  |  |
| --- | --- |
| Unexpected situation | Mitigation strategies |
| Worker sick for the day | Request for temporary worker / divide workload between workers / adjust project timeline |
| Critical parts fail to arrive on expected day | Use alternate parts / source from another supplier / adjust project timeline / work on another part of the project. |

Most students answered well.

Question 12a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark  | 0 | 1 | Average |
| % | 0 | 100 | 1.0 |

Students were asked to choose the most appropriate pump for the greenhouse. The correct answer was option A. All students answered correctly.

Question 12b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark  | 0 | 1 | 2 | Average |
| % | 0 | 0 | 100 | 2.0 |

Students were asked to justify their choice. It is supplied by DC current and has higher capacity than the 3200 L/hour pump.