VCE Systems Engineering

Written examination – End of year

Sample questions

These sample questions are intended to demonstrate how new aspects of Units 3 and 4 of VCE Systems Engineering may be examined. They do **not** constitute a full examination paper.

SECTION A – Multiple-choice questions

Question 1

A lift has a mass of 1000 kg. It is pulled up by a force of 19 600 N.

The acceleration of the lift is

A. 9.8 m s^{-2}

B. 19.6 m s^{-2}

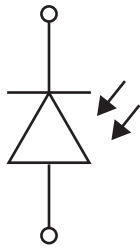C. 1000 m s^{-2}

D. $19 600 \text{ m s}^{-2}$

Question 2

In Australia, the nominal mains voltage is 230 V.

The value normally stated when referring to this voltage is

A.   peak value.

B.   RMS value.

C.   average value.

D.   instantaneous value.

Question 3

The device shown in the diagram above is a

A. Zener diode.

B. signal diode.

C. photodiode.

D. phototransistor.

Question 4

Devices such as printers rely on motors that can provide precise positioning.

Which one of the following motors would be best at providing precision positioning?

A. servomotor

B. stepper motor

C. brushed DC motor

D. brushless DC motor

Question 5

A solar panel system is to be designed to produce electrical energy.

In Australia, the best orientation for the panels would be facing

A. east.

B. west.

C. north.

D. south.

SECTION B

Question 1 (3 marks)

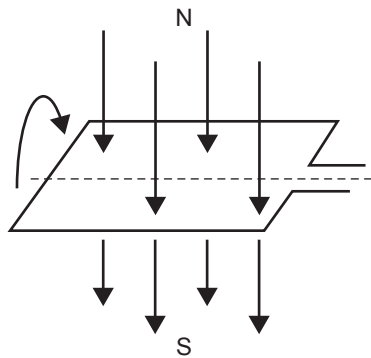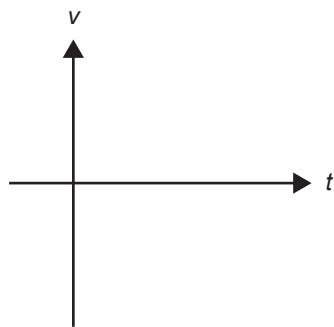A coil is rotated in a magnetic field that is perpendicular to the area of the coil, as shown in Figure 1.

Figure 1

a. On the axes provided below, draw the shape of the resulting voltage. 1 mark

b. Name the factors that would have determined the magnitude of the voltage produced. 2 marks

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Question 2 (3 marks)

Figure 2 shows the output voltage produced by a faulty bridge rectifier.
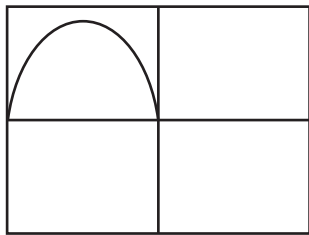

Figure 2

a. Name **one** component of the bridge rectifier that is faulty.   1 mark

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b. Explain how an oscilloscope can be used to find a faulty component.   2 marks

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Question 3 (2 marks)

A 3 A relay is rated at 24 V.

a. Calculate the amount of power that can be switched through the relay.   1 mark

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b. The same relay is also able to switch a current of 1.5 A.

What is the DC voltage at which this current can be switched?   1 mark

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Question 4 (2 marks)
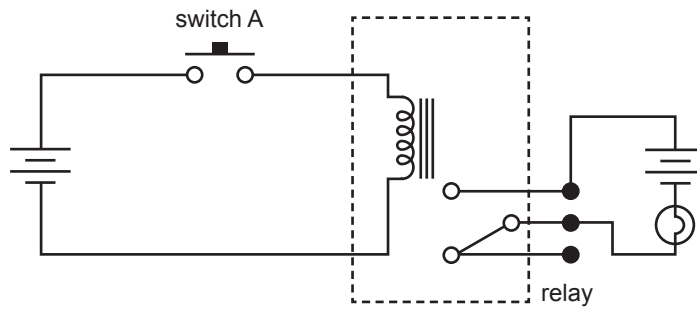
Consider the circuit shown in Figure 3.

Figure 3

a. What will happen when the push-button switch, A, is actuated in this circuit? 1 mark

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b. Name the type of relay used in Figure 3. 1 mark

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Question 5 (2 marks)

Explain how the angle of rooftop solar panels can affect the efficiency of the electricity produced by the solar panels.

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Question 6 (3 marks)

Explain the benefits of incorporating an open-source model in the development of an integrated and controlled system.

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Question 7 (3 marks)

Describe how solenoids are used in an automatic irrigation sprinkler.

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Question 8 (4 marks)

a. Explain why AC generators are the most commonly used electrical generators. 2 marks

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b. Describe the advantages of AC generators in comparison to dynamos and DC generators. 2 marks

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Question 9 (3 marks)

Name a device used to transform each of the following forms of energy into electrical energy.

• Solar energy _____

• Thermal energy _____

• Mechanical energy _____

Question 10 (4 marks)

A new technology company, in the field of solar energy, has applied cradle-to-cradle (C2C) analysis to the design and manufacture of its photovoltaic panels.

Discuss the advantages and disadvantages of using C2C analysis.

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Question 11 (5 marks)

Agriculture has been nominated as a highly significant growth area for Australia's future economy. Robotics is an example of a new technology that is increasingly being used in Australia's agricultural industry.

Analyse the potential for the use of robotics in the agricultural industry. In your response, include a description of **one** possible application of agricultural robotics and comment on the likely impact of using robotics in the agricultural industry.

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Answers to multiple-choice questions

Question	Answer
1	A
2	B
3	C
4	B
5	C