



2850-256 DECEMBER 2014

Level 2 Certificate/Diploma in Engineering (IVQ)

Principles of electrical and electronics technology

Tuesday 11 December 2014
09:30 – 11:30

**You should have the
following for this examination**

- one answer book
- non-programmable calculator

General instructions

- All intermediate steps in calculations **must** be shown.
- All questions do **not** carry equal marks. The maximum marks for each section within a question are shown.
- Answer **all** questions.

Practice

- 1 a) State the basic SI unit for
- i) magnetic flux density
 - ii) force
 - iii) inductance. (3 marks)
- b) The basic SI unit for e.m.f. is the 'volt'. State the SI unit for a
- i) million volts (10^6)
 - ii) millionth of a volt (10^{-6}). (2 marks)
- (Total marks 5)
- 2 a) With reference to the following statement, state the **two** missing words.
 'Ohms' Law states that the current flowing through a circuit is _____ proportional to the voltage applied and _____ proportional to the circuit's resistance'. (2 marks)
- b) With reference to Table 1, use Ohms' Law to determine the values of sections labelled
- i) X
 - ii) Y
 - iii) Z. (3 marks)
- (Total marks 5)

Voltage	Current	Resistance
X	5	15
315	Y	105
30	0.5	Z

Table 1

- 3 With reference to the circuit shown in Figure 1, calculate
- a) circuit current (2 marks)
 - b) the voltage across R1 (1 mark)
 - c) the resistance of R1. (1 mark)
- (Total marks 4)

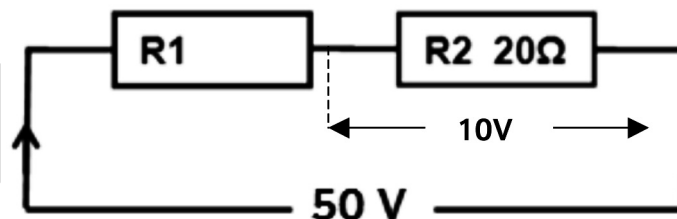


Figure 1

- 4 With reference to the circuit shown in Figure 2, calculate
- a) the supply voltage (V) (2 marks)
 - b) I_2 (2 marks)
 - c) the total resistance. (2 marks)
- (Total marks 6)

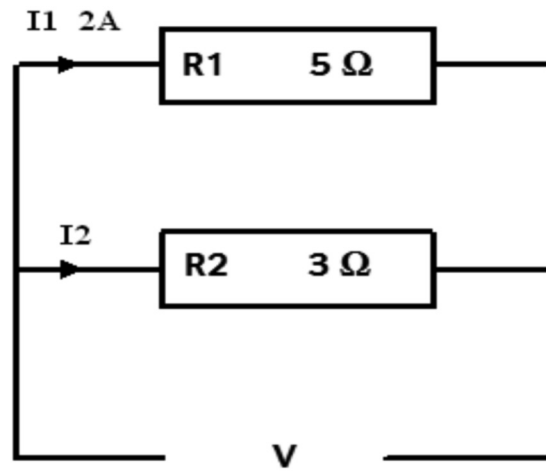


Figure 2

- 5 With reference to the circuit shown in Figure 3, calculate the total
- a) power consumed (2 marks)
 - b) energy used in 0.5 minutes. (3 marks)
- (Total marks 5)

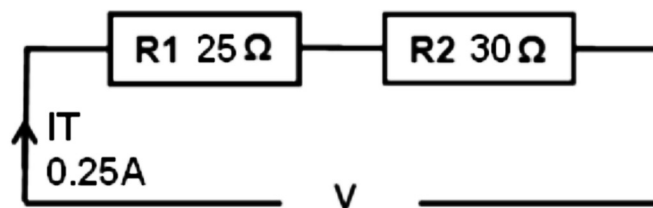


Figure 3

- 6 a) With reference to the circuit shown in Figure 4, describe the function of the solenoid when SW1 is
- open (1 mark)
 - closed. (3 marks)

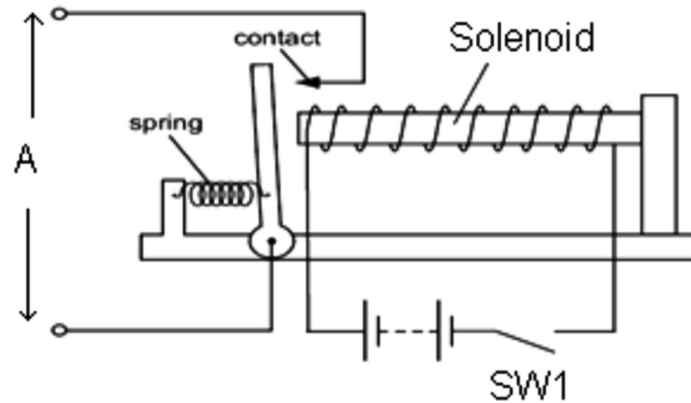


Figure 4

- b) With reference to Figure 5 that shows a transformer.
- State the type of transformer. (1 mark)
 - Describe the **main** difference between this type and a double wound type. (2 marks)
 - State the purpose of the tapped connections 1 – 6. (1 mark)

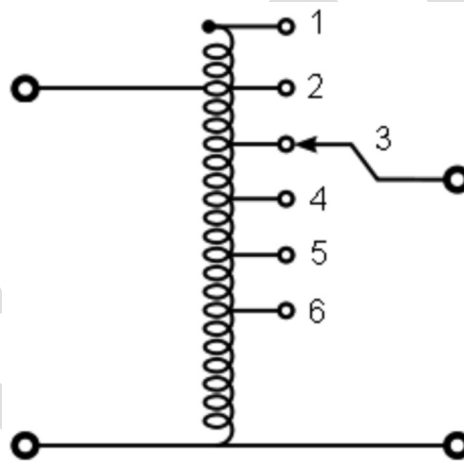


Figure 5

- Describe the function of a bi-polar transistor when used as
 - a switch
 - an amplifier. (4 marks)
- Describe the function of **each** of the following components of a rotating machine that generates ac.
 - Magnetic field. (1 mark)
 - Armature. (2 marks)
 - Slip rings. (1 mark)
- With the use of a simple circuit diagram, show the function of a Light Emitting Diode (LED) supplied from a 10 Volt source. (4 marks)

(Total marks 20)

- 7 A bi-polar transistor is used to interface a computer port to a dc motor.
- State why this is necessary. (1 mark)
 - Describe its operation in terms of
 - input activity
 - output activity. (4 marks)
 (Total marks 5)
- 8 With reference to the use of a portable transformer.
- Using a simple diagram, show how it can provide a 100 V ac from a 230 V ac supply. (2 marks)
 - State the turns ratio. (1 mark)
 - Describe how it provides safety isolation. (2 marks)
- (Total marks 5)
- 9 With reference to the circuit shown in Figure 6, calculate
- the total circuit current (2 marks)
 - V_{R2} (2 marks)
 - $V_{R1/2}$. (3 marks)
- (Total marks 7)

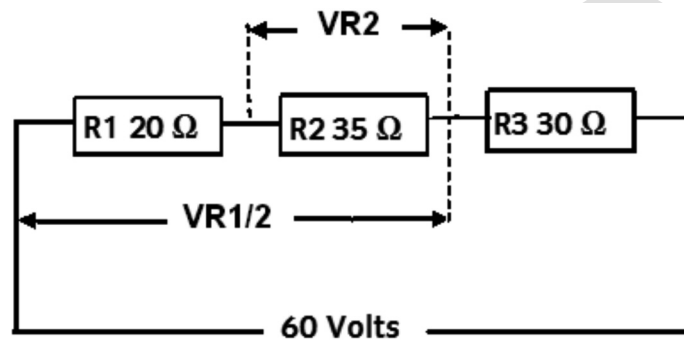


Figure 6

- 10 With reference to the circuit shown in Figure 7, calculate the
- current flowing through
 - R1
 - R2
 - R3
 (6 marks)
 - resistance of R3. (2 marks)
- (Total marks 8)

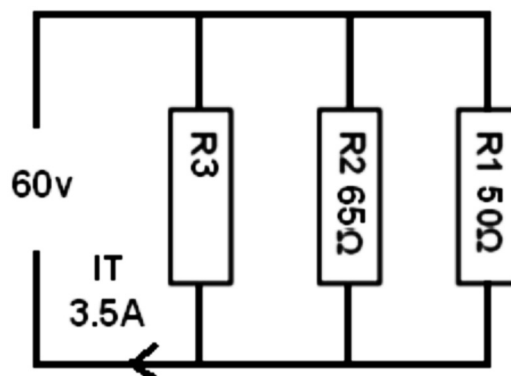
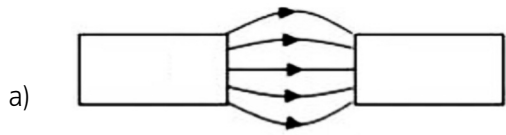
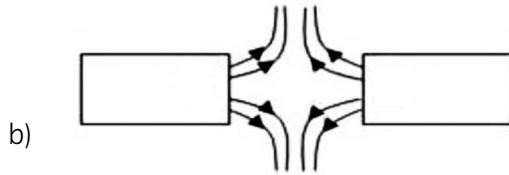


Figure 7

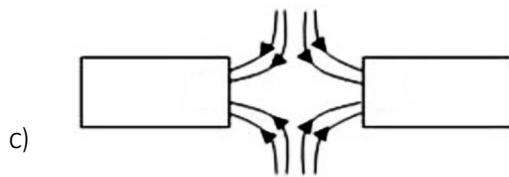
11 Determine the pole polarity, left and right, for **each** of the magnetic field patterns shown in Figure 8.



(1 mark)



(2 marks)



(2 marks)

(Total marks 5)

Figure 8

12 Figure 9 shows a solenoid arrangement.

a) Determine the polarity at the end marked X. (2 marks)

b) Looking in from point Y, determine the direction of the current. (3 marks)

(Total marks 5)

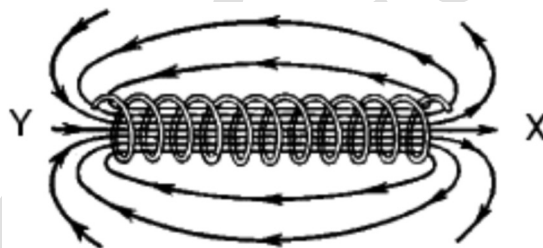


Figure 9

13 Describe the structure of **each** of the following types of capacitor.

a) Electrolytic. (2 marks)

b) Air spaced. (1 mark)

c) Paper. (2 marks)

(Total marks 5)

14 Sketch a sine wave, clearly indicating

a) **one** complete cycle (2 marks)

b) peak-to-peak value (1 mark)

c) root mean square value. (2 marks)

(Total marks 5)

- 15 Figure 10 shows a voltage transformation system. Calculate the
- a) voltage across point A (2 marks)
 - b) turns ratio of T2. (3 marks)
- (Total marks 5)

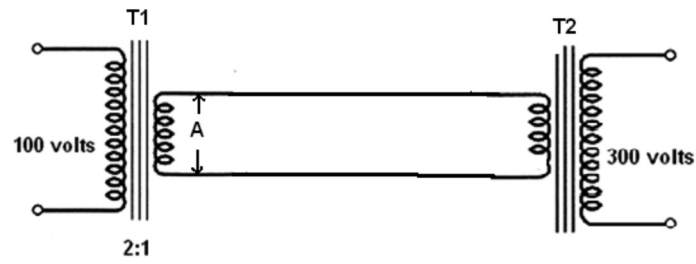


Figure 10

- 16 With reference to a bridge rectifier, describe how **each** of the following is achieved.
- a) Full wave rectification. (3 marks)
 - b) Smoothing. (2 marks)
- (Total marks 5)

Practicise