061006T4ICT

ICT TECHNICIAN LEVEL 6

IT/OS/ICT/CC/01/6

Apply Basic Electronics

November / December 2025

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

WRITTEN ASSESSMENT

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** (3) questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. Do not write on the question paper.

This paper consists of FIVE (5) printed pages

Candidate should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing

SECTION A (40 MARKS)

Answer ALL the question in this section

1. Name one application of an insulator and one application of semi-conductor materials in real life. (2 marks)
2. A varistor is a non-linear component in a circuit.
   a) Describe the operation of this device. (2 marks)
   b) State TWO types of this component. (2 marks)
3. One of the bipolar Junction Transistor is a PNP transistor
   a) Explain its structure. (2 marks)
   b) Describe its working principle. (2 marks)
4. Draw a well labelled the circuit symbol of zener diode, label its terminals, and indicate the direction of current flow. (2 marks)
5. Figure 1 below shows an atomic mass notation for an element. Use it to answer the questions that follow.

Figure 1

   a) Identify TWO electrical properties of the atom. (2 marks)
   b) Name other two elements in the group. (2 marks)
6. Binary Coded Decimals are used in designing digital systems.
   a) Describe 2421 BCD type. (2 marks)
   b) Outline TWO advantages of the BCD type in a) above. (2 marks)
7. In a reverse-biased p–n junction, when the applied voltage is gradually increased, the electric field across the depletion region becomes very strong leading to the process of avalanche electron.
   a) Explain how this process occurs. (2 marks)
   ~~b)~~ Give two practical application of this phenomenon in electronic devices.(2 marks)
8. Explain how the magnitude of the applied voltage affects the depletion layer of a p-n junction. (4 marks)
9. A sinusoidal voltage has a maximum value of 120 V. Calculate its :
   a) r.m.s(root mean square) and

b) Average values. (4 marks)

10. List FOUR reasons for using Integrated circuits in designing electronic systems. (4 marks)

11. State FOUR functions of Read Only Memory. (4 marks)

SECTION B (60 MARKS)

Answer any THREE questions in this section

12. A trainee was doing research on transistors operation and come across a transistor diagram shown in figure 2 below.

a) Explain its operation. (4 marks)

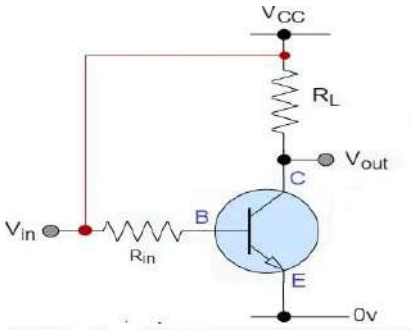

Figure 2

b) Study the figure 3 below and answer the questions that follow;

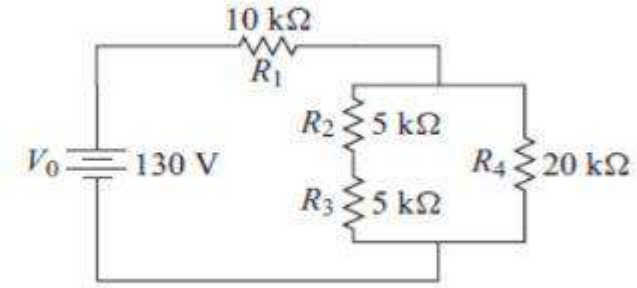

Figure 3

i) Calculate the total resistance in the circuit. (4 marks)

ii) Determine the total current flowing through the R1. (3 marks)

iii) Determine power dissipated in the circuit. (3 marks)

c) A household lighting circuit is connected to a 240 V mains supply and protected by a 13 A fuse. Each electric light bulb in the circuit is rated at 100 W.

i. Determine the maximum number of bulbs that can be operated simultaneously

without blowing the fuse. (3 marks)

ii. If all the bulbs are switched on for 1 hour, calculate the total energy consumed in Joules. (3 marks)

13. An automatic bulb is designed using two Capacitors C1 and C2 connected in series of value 4 Farads and 2 Farads with an internal power source of 12 volts.

a) Calculate the following.

i. The total capacitance of the circuit. (2 marks)

ii. The total charge in the circuit. (2 marks)

iii. The voltage drop across c1 and c2. (4 marks)

b) A trainee wanted to design a circuit using a 12 V DC power supply, a capacitor, an inductor of 10mH, and an LED (light emitting diode) such that the LED blinks once every 4 seconds.

a) Determine the value of the capacitor needed for the design. (3 marks)

b) Mention TWO challenge the trainee will experience with the design. (2 marks)

c) Alkaline cells and lead acid cells are types of rechargeable secondary cells.

i. Describe the mechanism on how these cells recharge (3 marks)

ii. Mention TWO distinctive differences of these cells (4 marks)

14. a) State the following theorems as used in electronics

i. Superposition theorem (2 marks)

ii. Theremin's theorem (2 marks)

b) Figure c below shows a common representation of Lenz Law. Name the properties of the law which are usually identified by the part labelled i, ii, and iii. (3 marks)

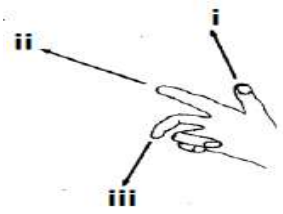

Figure c

b) Perform the following operations:

i. 575+895 using BCD representation (3 marks)

ii. 11011001-10100111 using 1's complement (3 marks)

c) Describe how the following types of semiconductors are formed stating their charger carrier mechanism.

i. P-type. (2 marks)

ii. N-type (2 marks)

d) List three uses of photo diode. (3 marks)

15. a) Stanley observed different types of secondary memory devices while working with computers. Explain FOUR types of such memory. (8 marks)

b) Mention distinctive areas of application of each of the following inductors.

i. Air core inductor (1 mark)

ii. Iron core inductor (1 mark)

iii. Variable inductor (1 marks)

c) Internet of Things (IoT) is one of the emerging trends in the world of electronics.

i. Mention ONE real-world applications of IoT in everyday life. (1 marks)

ii. State TWO challenges associated with IoT implementation. (2 marks)

d) Parallel circuits are often preferred over series circuits in electrical systems. Describe THREE advantages of this circuits (6 marks)