

**061006T4ICT**  
**COMPUTER SCIENCE LEVEL 6**  
**ICT/OS/CS/CC/01/6/A**  
**APPLY BASIC ELECTRONIC SKILLS**  
**NOV/DEC 2023**



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

**WRITTEN ASSESSMENT**

**TIME: 3 Hours**

**INSTRUCTIONS TO CANDIDATE**

1. *The paper consists of **two** sections: **A** and **B***
2. *Answer **ALL** questions in Section **A** and any **Three** from section **B***
3. *Marks for each question are indicated in the brackets*
4. *A separate answer booklet will be provided*
5. *Do not write on the question paper*

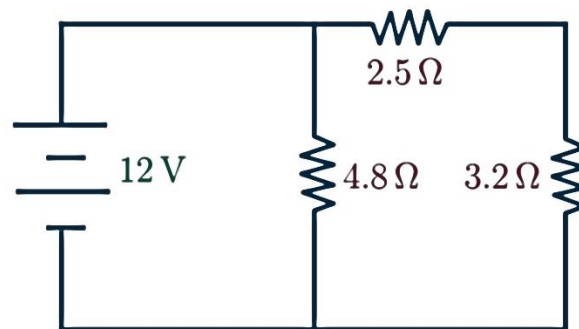
***Candidates should answer the questions in English***

***This paper consists of four (5) printed pages.***

***Candidates 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 questions in this section)*

1. State TWO types of transistors that are used in electronic equipment. (1 Mark)
2. Kiko is interested in assessing his comprehension of computer number systems. Convert the following binary equivalents into octal number and decimal number respectively:
  - a) Binary  $1011.1011_2$  to octal number (2 Marks)
  - b) Binary  $0.0111_2$  to decimal number (2 Marks)
3. Using the circuit depicted in Figure 1, determine the current passing through it when it is powered by a 12-volt source. (3 Marks)

*Figure 1*

4. Highlight TWO advantages of using Integrated Circuits (ICs) as the prevailing technology for manufacturing electronic devices. (2 Marks)
5. Explain the term *diode* as used in basic electronics. (2 Marks)
6. Distinguish between *inductance* and *conductance* as used in electronics. (2 Marks)
7. Describe the position of the chemical potential in an n-type semiconductor at room temperature. (2 Marks)
8. Explain the meaning of the following terms as used in semiconductors:
  - a) P–N junction (2 Marks)
  - b) Doping (2 Marks)

9. A transistor has  $\beta = 50$ , if the voltage across  $5k\Omega$  resistance which is connected in the collector circuit is 5 volts. Calculate the base current for the common emitter connection. (4 Marks)
10. Explain TWO ways in which charge carriers are transferred in semiconductor. (4 Marks)
11. A powerful power supply unit for a Datacentre Server is rated 1000W, 240V. Find the current drawn and resistance of the supply unit. (3 Marks)
12. Outline THREE precautionary measures while handling a multi-meter. (3 Marks)
13. Diodes are commonly used in electronic equipment. List THREE examples of special diodes that are commonly used in such equipment. (3 Marks)
14. State THREE characteristics of volatile memory. (3 Marks)

**SECTION B (60 Marks)**

*(Answer any THREE questions in this section)*

15. You are invited for an interview as a computer scientist with a software development company. In order to establish that you have got underpinning knowledge in electronics, you are required to answer the following panel questions:

- a) Perform the conversions for each of the following number system: (12 Marks)
  - i.  $720_{10}$  to Octal
  - ii.  $5BC_{16}$  to Decimal
  - iii.  $EA54.25_{16}$  to Binary
  - iv.  $617.25_{10}$  to Binary
- b) Compute  $10110_2 - 11010_2$  (3 Marks)
- c) Justify FIVE reasons why Silicon is preferred over Germanium for semiconductor devices. (5 Marks)

16. You have been hired as the officer in charge of information systems development in a newly established company. The management of the company seeks to develop a new management information system for its business operations:

- a) With an aid of a sketch, outline the configurations of P-N junction diode showing both the input signal and output signal. (8 Marks)
- b) With an aid of a diagram, discuss the hierarchy of computer memory. (12 Marks)

17. Kefa has been assigned the responsibility of training newly hired employees at the computer engineering company where he is employed. As part of the training program, he needs to cover the subject of fundamental electronics.

- a) Using well-labelled diagrams, describe how a *P-N junction* diode is biased. (15 Marks)

b) Outline FIVE applications of PNP transistors that he will present.

(5 Marks)

18. An electronics technician is working on the design of a new system. She discovers that there are few considerations that she will have to look at when selecting the semiconductors to use before coming up with the circuit requirements.

a) Discuss FIVE differences between *intrinsic* and *extrinsic* semiconductors that will guide the technician on choosing the best semiconductor to use.

(10 Marks)

b) Sketch an ideal family of output characteristics ( $I_C$  versus  $V_{CE}$ ) for the circuit in the *figure 2* below for  $I_B = 5\mu\text{A}$  to  $25\mu\text{A}$  in  $5\mu\text{A}$  increments. Assume  $\beta_{DC} = 100$  and that  $V_{CE}$  does not exceed breakdown. (10 Marks)

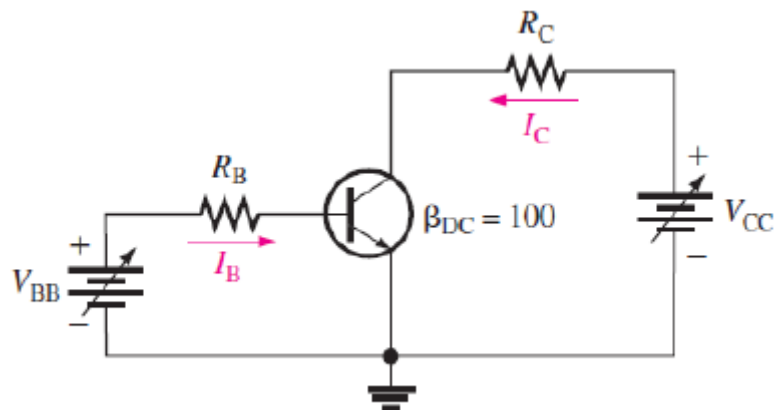


Figure 2

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