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071305T4EOP**ELECTRICAL OPERATION (POWER OPTION) LEVEL 5****ENG/OS/PO/CR/ 0.4 / 5****Demonstrate Understanding of Electronics****July/August 2025**Printed By: Technical And Vocational College Date: 25.07.2025
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**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

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WRITTEN ASSESSMENT**TIME: 3 HOURS**

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INSTRUCTIONS TO CANDIDATE

1. This paper consists of **TWO** sections: **A** and **B**.
2. Attemptions 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.

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This paper consists of THREE (3) 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)*Attempt ALL questions in this section*

1. Materials used in the up of atoms, which contribute to the electrical properties of the material. Outline THREE groups of materials used in electronics.
(3 Marks)
2. Thermionic emission is the emission of electrons from an electrode when the electrode is heated. List THREE factors affecting the rate of thermionic emission.
(3 marks)
3. The electrical conductivity of semiconductors changes with temperature variations. Explain TWO effects of temperature on semiconductors.
(4 marks)
4. With reference to semiconductor theory, define the following terms
 - i. Holes; (1 mark)
 - ii. Atom; (1 mark)
 - iii. Biasing. (1 mark)
5. Electronic components are used in industrial technology to design circuits and devices. Sketch symbols of the following electronic components
 - i. Zener diode (1 mark)
 - ii. Unijunction transistor; (1 mark)
 - iii. LED. (1 mark)
6. A transistor has three terminals which can be connected to a difference source. Name the THREE terminals of a transistor.
(3 Marks)
7. Electronics is a branch of engineering which deals with conduction through vacuum, gas or semiconductor. List FOUR applications of electronics in engineering.
(4 marks)
8. Resistor has different colour bands which can be used to determine values or sizes of resistors. Determine the resistance of resistors with the following colour bands.
 - i. Orange, Green, Red, Blue, Violet; (2 marks)
 - ii. Red, Violet, Yellow, Black, Red, Black. (2 marks)

Printed By: The transistor amplification process forms the basis for the operation of various electronic devices. Name FOUR classes of transistor amplifiers. (4 marks)

9. ~~Files are used for sign g and current control. State FOUR types of files.~~

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(4 marks)

10. Several electronic components are commonly used in electronic circuits. Differentiate between active and passive electronic components, giving examples of each.

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(4 marks)

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SECTION B (60 MARKS)

Attempt any THREE (3) questions in this section

11. a) The output of a rectifier circuit contains ripples. Using a circuit diagram and waveforms, explain the process of eliminating ripples in a rectifier circuit using a

C-filter (8 marks)

- b) A Transistor is a device consisting of two PN junctions. Using a diagram, explain the working of the following types of transistor:

i. P-N-P Transistor; (6 marks)

ii. N-P-N Transistor. (6 marks)

12.

- a) An a.c voltage of peak value 20V is connected in series with a silicon diode and load resistance of 500Ω . If the forward resistance of the diode is 10Ω , find;

i. Peak current through the diode (2 marks)

ii. (3 mark)

- ii. i. What will be the peak voltage and current if the diode is assumed to be ideal? (2 marks)

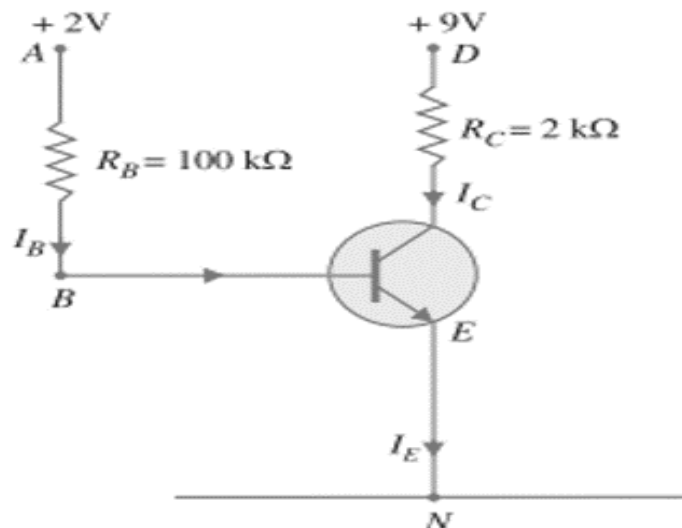
- b) Rectifiers are used in electronic circuits to convert a.c. supply to d.c. supply. Using a circuit diagram, describe the operation of a Centre-tapped full-wave rectifier. (8 marks)

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- c) Figure 1 below shows transistor biasing with the base resistor method.

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Figure 1

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- i. Determine the collector current I_C and collector-emitter voltage V_{CE} . Neglecting the small base-emitter voltage. Given that $\beta = 50$; (3 marks)
- ii. If R_B is changed to $50\text{ k}\Omega$, find the new operating point. (3 marks)

13.

- a) Using diagrams, explain the following methods of biasing a PN junction.

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(5 marks)

- ii. Forward biasing.

(5 marks)

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- b) Special semiconductor devices are constructed for specific functionalities. Describe the construction and operation of silicon-controlled rectifier. (10 marks)

14.

- a) In electronic circuits, transistors are configured according to their amplification. With the aid of a circuit diagram, describe the following methods of transistor configurations.

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- i. Common emitter configurations; (2 marks)
- ii. Common base configurations (2 marks)
- iii. Common collector configurations. (2 marks)

Printed By: Extrinsic semiconductors are subdivided into two classes. Using diagrams,

explain the formation of the following extrinsic semiconductors.

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P-type; (5 marks)

- iv. N-type.

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- b) In semiconductor theory, materials have various types of energy bands. Describe TWO types of energy bands. (4 marks)

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