051005T4ICT

ICT TECHNICIAN LEVEL 5

IT/OS/ICT/CC/01/5

APPLY BASIC ELECTRONIC

NOV/DEC 2023

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

WRITTEN ASSESSMENT

Time: 3 Hours

INSTRUCTIONS TO CANDIDATE

1. This paper has THREE sections A, B and C. Attempt questions in each section as per instructions given in the section.
2. You are provided with a separate answer booklet.
3. Marks for each question are indicated in the brackets.
4. Do not write on the question paper

This paper consists of 9 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: 20 MARKS

Answer ALL the questions in this section.

Each question carries one Mark.

1. Which of the following is an application of Zener diode?
   A. Rectifier
   B. Voltage regulator
   C. Amplifier
   D. Oscillator
2. What happens to the width of the depletion region when a PN junction is forward biased?
   A. It increases.
   B. It remains the same.
   C. It decreases.
   D. It diminishes
3. During a practical lesson in Matyra TVC, level 5 learners were tasked with making an integrated circuit (IC). Which of the following material did they use?
   A. Silicon
   B. Germanium
   C. Copper
   D. Glass
4. When a Semi-Conductor material is heated, it's resistance_____
   A. Decreases
   B. Increases
   C. Does not change
   D. Increase then Decreases
5. In digital logic circuits, there are several types of gates, each with its unique behavior when inputs are connected in different ways. What is the resulting circuit when inputs of a NAND gate are connected together.
   A. OR gate
   B. AND gate
   C. NOT gate
   D. XOR gate
6. Babu just finished measuring electric power and is recording his results. The rate of change in electric power was measured in?
   A. Joules

B. Henry

C. Voltage

D. Wattage

7. In a logic circuit, an OR gate has 4 inputs. If one input is high (1) and the other three are low (0) the output is _____

A. low

B. high

C. Alternately high and low

D. May be high or low depending on the magnitude of inputs

8. The teacher gave you a list below showing the properties of power. Select one that is not.

A. Power

B. Period

C. Frequency

D. Amplitude

9. In a parallel circuit, the purpose of resonance is to magnify _____ at the resonant frequency while minimizing the voltage across the components.

A. Current

B. Voltage

C. Power

D. Frequency

10. The peak factor is a measure of the variation between the peak and average values of a waveform. Which of the following waves has the highest value of peak factor?

A. Square wave

B. Sine wave

C. Half wave rectified sine wave

D. Triangular wave

11. Nyambane and Musuya are carrying out an experiment on an atom to determining the chemical properties and reactivity of an element. The electrons present in the outermost shell of an atom are called_____
    A. Core Electrons
    B. Valence Electrons
    C. Extra electrons
    D. Free Electrons
12. The _____ program compresses large files into a smaller file
    A. WinZip
    B. WinShrink
    C. WinStyle
    D. Acrobat Reader
13. By interpreting the colors of the bands on a resistor you get a visual and standardized way to represent the resistance value, making it easier to identify and use resistors in electronic circuits. Color coding is used to indicate _____ value of a resistor
    A. Numerical
    B. Alphabetical
    C. Resistance
    D. A & C are correct
14. The specific type of logic gate implemented with a single transistor depends on the configuration and connection of the transistor within the circuit. Which of the following gate is used to implement a single transistor?
    A. NAND
    B. OR
    C. NOR
    D. NOT
15. Electrical quantities are physical properties that describe and quantify the behavior of electricity. Select one whose value varies in a non-continuous manner.
    A. Analogous
    B. Encapsulation
    C. Digital
    D. Frequencies

16. Which digit is represented by a green band on a resistor?
    A. 4
    B. 5
    C. 6
    D. 3
17. A fundamental concept in physics is a principle or idea that forms the basis for understanding and explaining various phenomena and natural laws in the physical world. Select the maximum _____ energy of emitted electrons that is linear to the frequency of light flux.
    A. Potential
    B. Kinetic
    C. Elastic
    D. Radiant
18. Nyambura provided students with the list of materials below. Which of them is an example of insulator material?
    A. Mica
    B. Silicon
    C. Copper
    D. Gold
19. The total number of electrons in an atom is known as_____
    A. Atomic radius
    B. Atomic number
    C. Atomic size
    D. Atomic weight
20. Which of the following material is the best semiconductor
    A. Silicon
    B. Germanium
    C. Carbon
    D. Wood

SECTION B: 40 MARKS

Answer all questions in this section.

21. Level 5 learners were required to bring to class amplifiers that will be used to boost the strength of a signal. List FOUR types of amplifiers they brought to increase the power of signal during transmission. (4 Marks)
22. Semiconductors play a crucial role in electronics, as they can be used to control and manipulate electrical signals. Define the following types of semiconductors
    i. Intrinsic semiconductor (2 Marks)
    ii. Extrinsic semiconductor (2 Marks)
23. A cathode ray oscilloscope (CRO) operates on the principle of deflecting an electron beam onto a phosphorescent screen to create a graphical representation of the input signal. The basic principle of a CRO involves several key components and processes. Describe the following basic principle of a cathode ray oscilloscope. (4 Marks)
    i. Electron gun
    ii. Y plates
24. You have been given two input variables. Draw a truth table of a NOR gate using the two input variables. (3 Marks)
25. Bipolar transistors have distinct region of operation. Outline THREE of these regions defined by junction biases. (3 marks)
26. The choice of biasing method depends on the specific requirements of the circuit, such as stability, temperature compensation and the desired Q-point. Highlight FOUR types of biasing used to establish a fixed level of current and voltage. (4 marks)
27. Convert 830_{10} to its hexadecimal equivalent. (3 Marks)
28. Determine current in a closed circuit having two resisters connected in series of values 10Ω and 15Ω respectively with an EMF of 4.5V. (4 Marks)
29. Cache memory is a fundamental component of modern computer architectures. State FOUR advantages of a computer cache memory. (4 Marks)
30. Define each of the following terms as used in electronics:
    i. Cycle (2 Marks)
    ii. Peak (2 Marks)

31. Analog and digital signals are two fundamental types of signals used in electronics. They have distinct characteristics and are suitable for different applications. Differentiate between the two as applied in electronics (3 Marks)

SECTION C:40 MARKS

Answer any TWO questions in this section.

32.

a) Understanding the ideal characteristics of op-amps is essential for circuit analysis and design and provides a benchmark against which real op-amp performance can be evaluated. Outline TWO characteristics of an ideal operational amplifier (4 Marks)

b) Determine the decimal equivalent of each of the following number system.

   a. $FC7_{16}$ (3 Marks)

   b. $1010\ 1101_2$ (3 Marks)

c) Boolean logic uses a set of fundamental logic gates to manipulate and process binary data. These gates serve different logical functions and have distinct truth tables and symbols. Give TWO differences between AND gate and OR gate as applied in Boolean logic. (4 Marks)

d) In basic electronics, the electrical conductivity of materials is a crucial concept. Materials are categorized based on their electrical conductivity. Explain THREE solid state materials according to electrical conductivity as applied in basic electronics (6 Marks)

33.

a) Breadboards provide a hands-on, practical approach to learning and experimenting with electronics and are an essential tool in the toolkit of electronics enthusiasts and professionals. Name THREE Key features of breadboards in the context of electronics prototyping. (3 Marks)

b) Electrodes and electrolytes are essential components of batteries, and they have distinct roles in the operation of these energy storage devices. Distinguish between electrode and electrolyte as used in batteries (3 Marks)

c) The number of neutrons in an atom can vary among different isotopes of the same element, leading to differences in nuclear stability and other properties. Clarify THREE functions of the neutron in an atom (6 Marks)

d) In a basic electronic lesson, students are asked to construct a simple circuit using common electronic components. Describe FOUR components they will use. (8 Marks)

34.

a) The choice between two types of SRAM depends on the specific requirements of the application and the trade-offs between simplicity and timing precision. Outline the difference between asynchronous and synchronous as a character of static RAM . (4 Marks)

b) Emerging trends in electronic manufacturing bring both opportunities and challenges. As technology evolves, the electronic manufacturing industry faces several significant challenges. Discuss any **six** challenges of emerging trend in electronic manufacturing. (12 Marks)

c) Explain each of the following terms as applied in batteries

i. Float charging (2 Marks)

ii. Memory effect (2 Marks)

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