061306T4CSC

COMPUTER SCIENCE LEVEL 6

ICT/OS/CS/CC/01/6/A

Demonstrate Basic Electronic Skills

Nov/Dec 2024

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

WRITTEN ASSESSMENT

Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. Marks for each question are indicated in the brackets.
2. The paper consists of **TWO** sections: **A** and **B**.
3. Candidates are provided with a separate answer booklet
4. **DO NOT** write on this question paper.

This paper consists of FOUR (4) 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. An electronic circuit is a structure that directs and controls electric current in order to perform some useful function. Differentiate between a charge and current. (2 marks)
2. A semiconductor is a substance that has resistivity that is in between conductors and insulators. Outline THREE properties of semiconductors. (3 marks)
3. Electronics is the branch of engineering which deals with current conduction through a vacuum, gas or semiconductor. Highlight FOUR applications of electronics. (4 marks)
4. Transient Voltage Suppression Diode protect electronic devices from the sudden change in the state voltage transients. These changes may damage the device output response. Outline FOUR characteristics of this diode. (4 marks)
5. A source e.m.f. of 5V supplies a current of 3A for 10minutes. How much energy is provided in this time? (3 marks)
6. Particles in an atom are held in the atomic structure by different bonds. Define each of the following bond with respect to semiconductors: (4 marks)
   a) Covalent bond
   b) Trivalent element

7. In order to select the right kind of capacitor it is necessary to understand the particular capacitor application so that its properties can be matched to the given use. Distinguish between the TWO types of capacitors as used in amplifiers. (4 marks)
   a) Coupling
   b) By-pass
8. The operating characteristics of a P-N junction depends on its connection to supply voltage. With the aid of a diagram, explain the forward Biased P-N junction. (5 marks)
9. A semiconductor is a material, whose conductivity can be controlled through the addition of impurities. Differentiate between intrinsic semiconductors and extrinsic semiconductors. (4 marks)
10. Determine the p.d. which must be applied to a $2k\Omega$ resistor in order that a current of $10mA$ may flow. (3 marks)
11. Cache memory is a high-speed semiconductor memory, which can speed up the CPU. Give four advantages of a cache memory. (4 marks)

SECTION B (60 MARKS)

Answer Any THREE Questions in This Section

12. a) Light Emitting Diodes are important semiconductor devices that have found adverse applications in the world today. Explain six applications of LEDs. (6 marks)

    b) Memory is the electronic holding place for instructions and data that your computer's microprocessor can reach quickly. Explain the following characteristics with respect to computer memory.

    i. Electrical Characteristics

    ii. Speed

    iii. Capacity (6 marks)

    c) Using a diagram describe the formation of p-n Junction diode under reverse bias. (8 marks)

13. a) 128×8 RAM chips are required to design a $2k \times 8$ memory. Determine the:

    i. Number of RAM chips required. (3 marks)

    ii. Number of address lines required to address $2kx8$ memory chips. (3 marks)

    iii. Number of address lines common common to all $128\ X8$ RAM chips (3 marks)

    iv. Size of the decoder to select the memory chips. (1 mark)

    b) Describe each of the following input and output data transfer schemes in microprocessor.

    i. Synchronous bus. (2 marks)

    ii. Asynchronous bus. (2 marks)

    c) State and explain two modes of DMA data transfer. (6 marks)

14. a) Electronic components are classified into active and passive components depending on their use of external power source to operate. State **four** properties of passive components. (4 marks)

    b) Perform the following number conversions: (9 marks)

    i. 11001_2 to its equivalent decimal number;

    ii. 74.562_8 into binary;

    iii. 1983_{10} to Hexadecimal.

    c) Simplify the expression: $(AB + C)(AB + D)$ (7 marks)

15. a) Digital electronics is the drive gear to the advancement technology design of display systems. Explain the following digital displays. (8 marks)

i. Light emitting diode displays (LEDs)
ii. Liquid crystal displays (LCDs)
iii. Organic Light-Emitting Diodes (OLEDs)
iv. Seven Segment Display

b) Draw and explain the voltage-current (V-I) characteristics curves of a P-N junction diode. (12 marks)

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