

KENYA CERTIFICATE OF BASIC EDUCATION (K.C.B.E)

MARKING SCHEME

GRADE 10: COMPUTER STUDIES (Theory) – TERM 1 – JANUARY 2026

SECTION A (40 MARKS)

1. (a) Define a computer (2 marks)

- ✓ A computer is an **electronic device that accepts data, processes it, and produces output according to instructions.**
- ✓ Alternative: A machine that **performs arithmetic and logical operations automatically.**
- ✓ Can store and retrieve data for later use.

(b) Give two reasons why modern society depends heavily on computers (2 marks)

- ✓ **Automation** of tasks reduces human labor.
- ✓ **Fast data processing and calculations.**
- ✓ Communication through **email, social media, and online platforms.**
- ✓ Access to **information and knowledge online.**
- ✓ Support in **healthcare, education, banking, and transportation.**
- ✓ **Storage and retrieval** of large amounts of data.

2. Early computing devices

(a) Main purpose of the Abacus (1 mark)

- ✓ To **perform arithmetic calculations** such as addition, subtraction, multiplication, and division.
- ✓ Early tool for **counting and record keeping.**

(b) How Napier's Bones worked (2 marks)

- ✓ Used **rods inscribed with multiplication tables** to simplify multiplication.
- ✓ Calculations were done by **adding numbers along the rods.**
- ✓ Simplified **long multiplication and division.**

(c) One limitation of the Pascaline (1 mark)

- ✓ Could only **perform addition and subtraction.**
- ✓ Mechanical errors were possible.
- ✓ Limited in speed and complexity.

(d) Two uses of Jacquard Loom in computing (2 marks)

- ✓ Introduced **punched cards** for automation.
- ✓ Demonstrated **programmable sequences.**
- ✓ Early concept used in **data storage and control of machines.**

3. Technology with its generation

Technology	Generation
Vacuum tubes	First Generation
Transistors	Second Generation
Integrated circuits (IC)	Third Generation
Very Large Scale Integration (VLSI)	Fourth Generation

4. Function of each type of bus

(a) Data bus (1 mark)

- ✓ Transfers **data between CPU, memory, and peripherals.**
- ✓ Bi-directional in many systems.

(b) Address bus (1 mark)

- ✓ Carries the **memory address** of data to be read or written.
- ✓ Determines **location of data in memory.**

(c) Control bus (1 mark)

- ✓ Carries **control signals** such as read/write, clock, and interrupt signals.
- ✓ Coordinates **operation of the CPU and peripherals.**

(d) System bus (1 mark)

- ✓ Combination of **data, address, and control buses.**
- ✓ Connects **all major components** of the computer.

5. Four main functional units of a digital computer (4 marks)

- ✓ **Input Unit** – receives data from the user.
- ✓ **Output Unit** – presents processed data.
- ✓ **Central Processing Unit (CPU)** – processes data.
- ✓ **Memory/Storage Unit** – stores data and instructions.
- ✓ Alternative additional units: **ALU (Arithmetic Logic Unit), Control Unit, Registers.**

6. Convert the following

(a) 18_{10} to binary (2 marks)

- ✓ $18 \div 2 = 9$ remainder 0
- ✓ $9 \div 2 = 4$ remainder 1
- ✓ $4 \div 2 = 2$ remainder 0
- ✓ $2 \div 2 = 1$ remainder 0
- ✓ $1 \div 2 = 0$ remainder 1

Binary: 10010_2

(b) 62_{10} to octal (2 marks)

- ✓ $62 \div 8 = 7$ remainder 6
 - ✓ $7 \div 8 = 0$ remainder 7
- Octal:** 76_8

(c) 255_{10} to hexadecimal (2 marks)

- ✓ $255 \div 16 = 15$ remainder 15 \rightarrow F
 - ✓ $15 \div 16 = 0$ remainder 15 \rightarrow F
- Hexadecimal:** FF_{16}

7. Function of each

(a) ALU (2 marks)

- ✓ Performs **arithmetic operations**: addition, subtraction, multiplication, division.
- ✓ Performs **logical operations**: comparisons ($>$, $<$, $=$).
- ✓ Responsible for **decision-making within the CPU**.

(b) Control Unit (2 marks)

- ✓ **Directs data flow** between CPU and peripherals.
- ✓ **Interprets instructions** from memory.
- ✓ Generates **timing and control signals**.

(c) Registers (2 marks)

- ✓ Temporary **storage inside CPU** for data and instructions.
- ✓ Speeds up processing by **holding intermediate results**.
- ✓ Includes **program counter, accumulator, instruction register**.

SECTION B (60 MARKS)

8. Computer generations and technologies

(a) Key technology per generation (1 mark each)

- i. First Generation \rightarrow **Vacuum tubes**
- ii. Second Generation \rightarrow **Transistors**
- iii. Third Generation \rightarrow **Integrated Circuits (ICs)**
- iv. Fourth Generation \rightarrow **Very Large Scale Integration (VLSI)**
- v. Fifth Generation \rightarrow **Artificial Intelligence (AI) and parallel processing**

(b) Two advantages of fourth-generation computers (2 marks)

- ✓ **Compact and portable** \rightarrow easy for school use.
- ✓ **High speed and performance** \rightarrow handle large tasks.
- ✓ **Energy efficient** \rightarrow lower electricity consumption.
- ✓ Can run **multitasking applications**.

(c) Two disadvantages of first-generation computers (2 marks)

- ✓ **Large size** \rightarrow occupied rooms.
- ✓ **High heat generation** \rightarrow prone to failure.

- ✓ Slow processing speed.
- ✓ Very expensive to maintain.

(d) One reason school prefers laptops (1 mark)

- ✓ **Portable**, lightweight, can be used in classrooms, libraries, or homes.
- ✓ Energy-efficient → runs on battery.

9. Von Neumann architecture

(a) Three key elements (3 marks)

- ✓ **Input/Output Unit**
- ✓ **Memory Unit**
- ✓ **Central Processing Unit (CPU)**

(b) Role in fetch–execute cycle (3 marks)

- ✓ CPU **fetches instructions** from memory.
- ✓ CPU **decodes** instructions using control unit.
- ✓ ALU **executes instructions** and stores results.
- ✓ I/O units handle **input of data and output of results**.

(c) Relationship among elements (3 marks)

- ✓ CPU communicates with **memory to fetch instructions**.
- ✓ Data flows from memory → CPU → I/O devices.
- ✓ Control signals coordinate timing of all operations.

(d) Three reasons why understanding architecture is important (3 marks)

- ✓ **Troubleshooting hardware problems**.
- ✓ **Upgrading components** effectively.
- ✓ **Optimizing performance** of programs and devices.
- ✓ Helps **understand computer limitations** and capabilities.

10. RISC vs CISC

(a) Two differences (4 marks)

RISC	CISC
Reduced Instruction Set	Complex Instruction Set
Single-cycle instructions	Multi-cycle instructions
Requires more RAM for programs	Requires less RAM
Simpler hardware design	Complex hardware

(b) Two advantages of RISC for battery devices (2 marks)

- ✓ **Consumes less power** → longer battery life.
- ✓ **Faster execution per instruction** → efficient for mobile apps.

(c) Two reasons some computers still use CISC (2 marks)

- ✓ Supports **legacy software** efficiently.
- ✓ Executes **complex instructions** in fewer lines of code.

(d) Two devices using RISC architecture (2 marks)

- ✓ Smartphones
- ✓ Tablets
- ✓ Raspberry Pi / Microcontrollers

11. Number conversions

(a) $101011_2 \rightarrow$ Decimal

$$1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 32 + 0 + 8 + 0 + 2 + 1 = 43_{10}$$

(b) $3A_{16} \rightarrow$ Decimal

$$3 \times 16^1 + 10 \times 16^0 = 48 + 10 = 58_{10}$$

(c) $72_{10} \rightarrow$ Hexadecimal

$$72 \div 16 = 4 \text{ remainder } 8 \rightarrow 48_{16}$$

(d) $1100_2 \rightarrow$ Octal

$$\text{Group binary: } 001\ 100 \rightarrow 14_8 \rightarrow 14_8$$

(e) One advantage of hexadecimal over binary

- ✓ **Shorter and easier to read.**
- ✓ **Easier to debug and represent memory addresses.**

12. Data flow in a computer

(a) Simple functional organization diagram (4 marks)



- ✓ **Label Input, Output, CPU (ALU & CU), Memory**

(b) Role of control signals (2 marks)

- ✓ **Coordinate timing** of data transfer.
- ✓ **Ensure correct operations** are executed.
- ✓ Control **read/write operations** between CPU, memory, and I/O devices.

(c) Two differences between primary and secondary storage (2 marks)

Primary	Secondary
Fast access	Slower access
Volatile	Non-volatile
Expensive per GB	Cheap per GB
Examples: RAM, Cache	Examples: HDD, SSD, CDs

13. Connecting external devices

(a) Define interface (2 marks)

- ✓ Interface is a **hardware or software component that allows communication between the computer and external devices.**
- ✓ Provides **standard connection and protocol.**

(b) Two types of ports (2 marks)

- ✓ USB (Universal Serial Bus)
- ✓ HDMI (High Definition Multimedia Interface)
- ✓ VGA, Serial, Parallel, Ethernet

(c) Function of ports

- ✓ USB → **Connect external devices like flash drives, keyboards, printers**
- ✓ HDMI → **Transmit high-quality audio and video to display devices**

(d) One advantage of USB over older serial ports (2 marks)

- ✓ **Faster data transfer speed**
- ✓ **Can connect multiple devices via hubs**
- ✓ Supports **plug-and-play** without restarting the computer

NOTE TO FACILITATORS (TEACHERS):

The marking scheme provided is not exhaustive. Facilitators are advised to use their professional judgment when awarding marks. Any correct, relevant, and scientifically or contextually acceptable answer that demonstrates understanding of the concepts should be credited. Where examples are required, learners may provide other valid examples apart from those listed in the scheme.

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