



UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

**SECOND YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

COMP 212: DIGITAL ELECTRONICS II

STREAM: R

TIME: 2 HRS

DAY: WEDNESDAY [11.30 – 13.30 P.M]

DATE: 28/01/2026

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

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INSTRUCTIONS: Answer Question *ONE* and any other *TWO* Questions

QUESTION ONE (30 MARKS)

- a) Name the major function of the term ic as applied in digital electronics. **(2 Marks)**
- b) Explain what you understand by the term logic family, with a clear narrative of how they are classified. **(4 Marks)**
- c) Define the following terms.
 - i. Register **(2 Marks)**
 - ii. Counter **(2 Marks)**
 - iii. Flip flop **(2 Marks)**
- d) Clearly differentiate Combinational from Sequential circuits. **(4 Marks)**
- e) Compare the following the two Types of Finite State Machines (FSM) with the aid of examples:
 - i. Deterministic finite state machine (DFSM)
 - ii. Non-deterministic finite state machine (NDFSM) **(6 Marks)**
- f) Explain the following performance characteristics of logic families:
 - i. Fan-out
 - ii. Noise immunity
 - iii. Propagation delay
 - iv. Power requirement **(8 Marks)**

QUESTION TWO (20 MARKS)

The multiplexer and demultiplexer market is experiencing significant evolution driven by advancements, especially the integration of multiplexers and demultiplexers into data centers to support cloud computing and big data analytics is gaining momentum. Multiplexing is the generic term used to describe the operation of sending one or more analogue or digital signals over a common transmission line at different times or speeds and as such, the device we use to do just that is called the multiplexer.

- a) Discuss some core demands that are driving the advancements of multiplexer technology. **(6 Marks)**
- b) Differentiate Multiplexer (MUX) from Demultiplexer (DEMUX) with the use of diagrams. **(6 Marks)**

- c) Articulate some key illustrations how artificial Intelligence is driving the advancements in MUX/DEMUX technology. (6 Marks)
- d) Explain how an encoder is different from a multiplexer. (2 Marks)

QUESTION THREE (20 MARKS)

- a) Name the Two Forms of Sequential Logic, and clearly distinguish their difference in terms of their state changes. (4 Marks)
- b) The resolution of an 8-bit weighted resistor- DAC is 0.2V. Determine:
 - i. The output voltage when the input code is 01100100.
 - ii. The maximum analog output voltage (4 Marks)
- c) Differentiate between static and dynamic Random Access Memory (RAM) (4 Marks)
- d) A register is a group of flip-flops temporarily storing binary data in a digital system. It acts as a small, fast storage memory within a computer's central processing unit or the arithmetic logic unit. The registers are this collection of flip-flops that have the capacity to hold n bits of data.
 - i. Explain why a register is referred to flip-flop. (2 Marks)
 - ii. Using a well-labeled diagram, describe the Structure of a Processor and its registers in digital devices. (6 Marks)

QUESTION FOUR (20 MARKS)

- a) Name **four** types of logic gates and clearly give their symbols. Show the output of each. (6 Marks)
- b) Recent news about **Adder Technology** focuses heavily on its use of emerging technologies, specifically **IP KVM (Keyboard, Video, Mouse) solutions**, to revolutionize workflows across industries like media and entertainment, control rooms, and industrial remote access.
 - i. Name and clearly differentiate the two adders that are used in digital devices. (6 Marks)
 - ii. Name and elaborate one emerging technology with the greatest potential that could revolutionize the development of adder workflows. (4 Marks)
- c) Compare the functions of SR flip-flop from JK flip-flop. (4 Marks)

QUESTION FIVE (20 MARKS)

- a) Differentiate between the following terms:
- i) Decoder and Encoder (2 Marks)
 - ii) Multiplexer and Demultiplexer (2 Marks)
- b) State **TWO** similarities and **TWO** differences between a demultiplexer and a decoder (4 Marks)
- c) As an engineer working with an electronics factory in Laikipia County you are tasked with choosing the memory technology for the electronic devices manufactured by your factory. Discuss when it will be ideal to use the following types of memories:
- i. TTL ([Transistor-Transistor Logic](#)),
 - ii. CMOS ([Complementary Metal-Oxide-Semiconductor](#)),
 - iii. ECL ([Emitter-Coupled Logic](#)). (6 Marks)
- d) Explain the difference between a register transfer statement and a conditional register transfer statement. Provide a symbolic example for each. (6 Marks)