



# TECHNICAL UNIVERSITY OF MOMBASA

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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

## UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL & ELECTRONICS ENGINEERING

**EEE 4520: EMBEDDED SYSTEMS**

END OF SEMESTER EXAMINATION

**SERIES:** JULY 2025

**TIME:** 2 HOURS

**DATE:** July 2025

### Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions.

**Question ONE** is compulsory in addition attempt any other **TWO** questions.

**Do not write on the question paper.**

### QUESTION ONE

- With aid of a block diagram of an embedded system architecture explain the function of each component and give one example of each 9 marks
- In an embedded system each task has to do a specific job, with aid of a five state flow diagram explain how a task transitions from state to another. 6 marks
- Draw the corresponding Data flow graph to illustrate the compilation process for the following block of program 5 marks

$$w = a+b; \quad x = a - c; \quad y = x+d; \quad x = a+c; \quad z = y+e;$$

### QUESTION TWO

- Distinguish between firmware and real time operating system. 4marks
- Explain any FOUR functions of an I/O interface in an embedded system 8 marks
- Describe the following scheduling algorithms applicable to embedded systems
  - Round- robin

- ii. Shortest job first
- iii. Pre-emptive multitasking
- iv. First in first out

8 marks

### **QUESTION THREE**

- a) Explain the following ADC terms as applied to embedded system operation
  - i. Resolution
  - ii. Offset error4 marks
- b) Describe any THREE categories of embedded systems based on the processor performance requirements6 marks
- c) With aid of a block diagram of hardware architecture of a navigation system describe its key components6 marks
- d) Explain the TWO critical aspects to be considered when selecting a processor for a given embedded system application4 marks

### **QUESTION FOUR**

- a) Describe the main stages of an embedded system development cycle using a waterfall model 8 marks
- b) Explain any THREE factors that impact embedded system design based on hardware component-performance constraint8 marks
- c) Distinguish between the following two steps involved in embedded system testing
  - i. Testing on the host system
  - ii. Testing on the target system4 marks

### **QUESTION FIVE**

- a) With aid of a block diagram of IP phone hardware architecture explain its operation.8 marks
- b) Explain any TWO advantages and disadvantages for using field programmable gate arrays(FPGA) processor in an embedded system8 marks
- c) Outline any FOUR tasks involved in the hardware design phase of an embedded system4 marks