



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED PHYSICS

EEE 4407: EMBEDDED SYSTEMS

SPECIAL/SUPPLEMENTARY 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. Attempt any other **THREE** questions.

Do not write on the question paper.

QUESTION ONE

- a) Distinguish between the following embedded system processor:
 - i. Von Neumann and Harvard architecture
 - ii. General and single purpose processor

8 marks
- b) Outline any TWO fields of application of embedded system in each case give TWO examples

4 marks
- c) Using dataflow graph show how the compiler performs the following arithmetic expression
Without optimization
 $Z = a \times b + 5 \times (c - d)$

4 marks
- d) Describe the following steps that constitute code compilation phase in embedded software Development
 - i. Code Translation
 - ii. Code Optimization

4marks

QUESTION TWO

- a) Outline any TWO reasons that may cause the process manager to:
 - i. Create a new process

ii. Terminate the running process

4marks

- b) With aid of a FIVE state process model , explain how the scheduler transitions a process in the various states 7 marks
- c) Distinguish between a process and a thread 4 marks
- d) Outline any FIVE items contained in process control block (PCB) as maintained by operating system and managed by process manager. 5 marks

QUESTION THREE

- a) Explain any TWO importance of carrying out embedded system analysis and optimization of
- i. Program performance
 - ii. Energy and power
- 8 marks
- b) Outline any TWO ways of carrying out performance testing and embedded system. 4 marks
- c) Explain any TWO ways of achieving embedded system design optimization using the following techniques:
- i. Code manipulation
 - ii. Memory usage
- 4 marks

QUESTION FOUR

- a) Distinguish between “Architecture Specific” and “generic” device drivers in each case give an example. 6marks
- b) Outline any FOUR functions performed by device drivers in an embedded system 4 marks.
- c) Describe the FIVE phases of embedded system co- design process 10marks

QUESTION FIVE

- a) Outline the essential hardware components that constitute an embedded network system (ENS) 4 marks
- b) Explain any THREE embedded network system design constraints 6 marks
- c) Outline any TWO basic activities provided by the kernel portion of the operating system 2 marks
- d) Distinguish between the following operating system terminologies

- i. Pre-emptive and non- preemptive scheduling
- ii. User and supervisor modes

8 marks