



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

THE DEGREE OF BACHELOR OF TECHNOLOGY IN ELECTRICAL AND ELECTRONIC ENGINEERING

TEE 4415 EMBEDDED SYSTEMS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

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 THREE questions.

Do not write on the question paper.

QUESTION ONE

- a) Explain any FOUR factors that present challenges to the development of dependable I/O subsystems for embedded systems. 8 marks
- b) One of the requirements to complete electrical engineering degree program, is to develop a project, outline any FIVE factors one needs to consider when selecting project's processor 5 marks
- c) With aid of a block diagram of program compilation process, highlight the function of each utility tool and in each case give the resulting program file 7 marks

QUESTION TWO

- a) with aid of a generic block diagram of hardware architecture of an embedded system, explain the function of its main units 8 marks

- b) Consider the following arithmetic expression in the two separate program basic block; For each draw the corresponding data flow diagram to illustrate its compilation process. 6 marks

i. { if (a + b > 0)
 x = 5
 Else
 x = 7 }
ii. a*b + 3*(c-d)

- c) With aid of a generic external device block diagram for an embedded system explain the significance of each component 6 marks

QUESTION THREE

- a) Outline any THREE:
- i. Special features that characterize an efficient embedded system
 - ii. Application areas of an embedded system 6 marks
- b) Explain any THREE significance of the following I/O sub system components applicable to a process control industry
- i. Fieldbus
 - ii. Intelligent I/O 6 marks
- c) With the aid of a block diagram of Fuzzy logic system explain the function of key components contained in its controller architecture 8 marks

QUESTION FOUR

- a) Outline any THREE
- i. Issues to take into account by embedded system designer when making a decision to implement a given functionality in either hardware or software.
 - ii. tasks involved in the hardware design phase of an embedded system 6 marks
- b) Describe any THREE factor that have characterized the trend in the growth of embedded systems 3 marks
- c) Describe the any THREE levels of embedded system design hierarchy abstractions 6 marks
- d) Draw a state diagram that illustrates how an automatic soda vending machine transitions into the different states when interacting with a customer 5 marks

QUESTION FIVE

- a) Describe any ONE design considerations required in the following DSP- based embedded systems:
- i. Stand alone
 - ii. PC add-on cards
 - iii. Networked systems 6 marks

b) Explain any FOUR significance of communication interfaces on embedded system

4

marks

c) With the aid of a PID controller block diagram describe the significance of feedback control system and control behaviour of each block

10 marks