



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF HEALTH & APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

THE DEGREE OF BACHELOR OF TECHNOLOGY IN APPLIED PHYSICS

EEE 4407: 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 metrics used to evaluate the dependability of an embedded system
4 marks
- b) Describe the following categories of embedded systems for each give a typical example.
 - i. Stand alone
 - ii. Networked
 - iii. Mobile devices6 marks
- c) With the aid of a block diagram describe the steps involved in the design of a fuzzy logic controller applicable to a process industry
10 marks

QUESTION TWO

- a) Explain any FIVE factors to consider when developing a software for embedded system
5 marks
- b) With the aid of a block diagram of a PID controller applicable to a process industry
 - i. Highlight the limitations of I and P-controller

- ii. Explain the remedy for (i) above 10 marks
- c) Outline any FIVE factors that you will consider when choosing a processor for a given medical embedded system or equipment 5 marks

QUESTION THREE

- a) Consider the basic block of C- program of table Q.3
 - i. Highlight the variable assignment observation
 - ii. Suggest the remedy to (i) above
 - iii. Draw the corresponding data flow graph to illustrate how the compiler will execute the associated operators 6 marks

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

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table Q.3

- b) With the aid of a generic block diagram of a closed loop embedded system structure explain the function of its main units 8 marks
- c) Describe any THREE factors to consider developing a dependable I/O subsystems for embedded systems. 6 marks

QUESTION FOUR

- a) Explain the FOUR factors that characterize the recent trend in embedded system design 8 marks
- b) Describe the significance of any THREE tests that is carried out on an embedded system 3 marks
- c) Explain any THREE significance of communication interfaces on embedded system 3 marks
- d) With aid of a block diagram highlight describe embedded system program compilation process and each case give the resulting program file 6 marks

QUESTION FIVE

- a) Embedded system design stage involves partitioning the system functionality into hardware and software components; explain any FOUR factors that needs to be considered when deciding to implement a given functionality in either hardware or software 4 marks
- b) Outline any TWO factors that contribute to the energy consumption during program execution in an embedded system 2 marks
- c) Data provide an excellent opportunity for minimizing a program size because the data are most highly independent on programming style; explain any THREE ways to achieve embedded system program size minimization with respect to data. 6 marks
- d) With aid of a block diagram a 5 layers model explain the function of each layer as applied to a networked embedded system. 8 marks