



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: AUGUST 2024

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) With aid of a design graph describe how an i^{th} abstraction level of embedded system is transitioned from behavioral to its physical dimension 10 marks
- b) For an embedded system describe the significance of the following tools as used to measure its program performance
- i. Simulator
 - ii. Timer
 - iii. Logic analyzer 6 marks
- c) Outline any FOUR critical aspects you need to considered when selecting a processor for your embedded system project 4 marks

QUESTION TWO

- a) Outline any THREE:
- i. Special features that characterize an embedded system
 - ii. Application areas of an embedded system 6 marks

- b) With the aid of timing and block diagram of four-cycle handshake bus protocols, describe the events that characterize the communication between any two embedded system devices 8 marks
- c) Describe any THREE factors that present challenges to development of dependable I/O subsystems for embedded systems. 6 marks

QUESTION THREE

- a) Outline any FOUR
- 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 8 marks
- b) Embedded system program optimization techniques ensure that compilation decisions that appear to be good for one statement are not unnecessarily problematic for other parts of the program.
- i. With aid of Flow diagram; describe how a part high level language source code is compiled to an assembly code 8 marks
 - ii. Draw the data flow diagram to illustrate the compilation process of the following arithmetic expression: $a*b + 3*(c-d)$ 4 marks

QUESTION FOUR

- a) Describe any FOUR factor that have characterized the trend in the growth of embedded systems 4 marks
- b) With aid of a block diagram describe the operation of a RFID system 8 marks
- c) Outline any TWO advantages and disadvantages of applying Bottom-up methodology in the design of an embedded system 4 marks
- d) Explain any FOUR basic assumptions that an embedded system developer should make while designing fuzzy control system, 4 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) Outline any FOUR specifications to consider when selecting an ADC for an embedded system.

4

marks

- c) You are required to design an Automatic Soda Vendor Machine (ASVM) that operates by initially presents the menu to the client to prompt the client to start the purchase process, prompts the client to insert the

money and it reads the amount inserted, the prompt the client to select the soda brand , upon which the chosen brand is delivered to the client and if there is change or balance in the money inserted it is given back to the client to end the process

- i. Write the pseudo code for the operation of the ASVM
- ii. Sketch the Finite State diagram of ASVM

10 marks