



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATIONS FOR BACHELOR OF SCIENCE IN ELECTRICAL AND
ELECTRONIC ENGINEERING
TEE 4431

MICROCONTROLLER

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 QUESTION ONE (COMPULSORY) and any other TWO Questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) (30 marks)

- (a) Explain FIVE distinguishing factors between microcontrollers and microprocessors. (8 marks)
- (b) Explain the following microcontrollers:
- (i) Embedded microcontrollers
 - (ii) External memory microcontrollers
 - (iii) 8-bit microcontroller (6 marks)
- (c) Explain the process of writing a program into the microcontroller chip (6 marks)
- (d) Draw the basic PIC microcontroller architecture microcontroller and explain the function of each block (10 marks)

QUESTION TWO

- (a) Explain the following program development tools and give ONE example for each case
- (i) Compiler
 - (ii) Linker

- (iii) Assembler
- (iv) Loader (8 marks)
- (b) State any FOUR features of the 8051 microcontroller (4 marks)
- (c) Explain the functions of the following 8051 microcontroller registers
 - (i) Data Pointer (DPTR)
 - (ii) Program Counter (PC)
 - (iii) Stack Pointer (SP)
 - (iv) Accumulator (8 marks)

QUESTION THREE

- (a) Explain the function of each of the following in microcontrollers
 - (i) I/O interfacing
 - (ii) Interrupts (4 marks)
- (b) Explain the following terms in programming the microcontroller
 - (i) Program modularization
 - (ii) Relocation
 - (iii) Position independent code
 - (iv) Parameter passing (8 marks)
- (c) An LED is connected to P1.2 of the 8051. Write a program in assembly language to blink the LED continuously with a time delay of one second (8 marks)

QUESTION FOUR

- (a) Write instructions for the PIC16F84 microcontroller, in assembly language, to initialize:
 - (i) PORTA as output
 - (ii) PORTB as input (4 marks)
- (b) An LED is connected to RA0 of PORTA on the PIC16F84A microcontroller, and a program is required to cause the LED to flash on and off continuously once the circuit is powered.
 - i. Draw the circuit
 - ii. Write the program (12 marks)
- (c) Explain the functions of sensors and actuators in microcontroller interfaces. (4 marks)

QUESTION FIVE

- (a) Explain the functions of the following:
 - (i) Serial port
 - (ii) Parallel port
 - (iii) Interrupt controller (6 marks)
- (b) Explain why the microcontroller must be reset from time to time (2 marks)
- (c) A switch is connected to RB1 of the PIC16F84A microcontroller, and an LED is connected to RB7. When the switch is closed, the LED blinks faster than when it is open.
 - (i) Draw the diagram
 - (ii) Write the program (12 marks)