



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN ELECTRICAL AND
COMMUNICATIONS ENGINEERING**

COURSE CODE: ECE 414

COURSE TITLE: MICROPROCESSORS

DATE: THURSDAY 14/12/2023

TIME: 12.00 PM - 2.00 PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over. 

QUESTION ONE

(a) Describe the key features and supported applications of the 7th generation microprocessors.

[8marks]

(b) Explain briefly the following types of programming languages

(i) Machine language [3marks]

(ii) Assembly language [3marks]

(iii) High level languages [3marks]

(c) With the aid of examples, explain the following types of interrupts [6marks]

(i) Vector

(ii) Maskable

(iii) Software

(iv) Hardware

(d) Explain briefly the following types of registers.

(i) Accumulator [2marks]

(ii) Instruction register (IR) [2marks]

(iii) Flags [3marks]

Question Two

(a) Explain how a program is executed in a microprocessor [5marks]

(b) Calculate the total time delay of the given assembly language programs. Assume the operating frequency of the microprocessor is 5MHz [6marks]

Memory address	Machine Codes	Labels	Mnemonics	Operands	Comments	T state
8000	06, 80		MVI	B, 80	Initialise Register B	7
8002	05	LOOP	DCR	B	Decrement Register B	5
8003	C2, 03, 80		JNZ	LOOP	Jump not zero to LOOP	10

(i)

Memory address	Machine Codes	Labels	Mnemonics	Operands	Comments	T state
8100	11, 00, 80		LXI	D, 8000	Initialise the DE register pair	10
8103	1B	LOOP	DCX	D	Decrement the DE register pair	5
8104	7B		MOV	A,E	Copy content of Register E in the accumulator	5
8105	B2		ORA	D	OR D with accumulator	4
8106	C2, 06, 81		JNZ	LOOP	Jump not zero to LOOP	10

(ii)

(c) Explain briefly the functions of the following in an 8086 microprocessor

i. Bus interface unit [3marks]

ii. Execution unit [3marks]

(d) Determine the physical address of an 8086 microprocessor when CS = 5300H and IP = 0200H. Write the starting and ending address of the code segment. [3marks]

QUESTION THREE

(a) A microprocessor system is comprised of three parts, namely the microprocessor the memory and peripheral devices. Discuss the three busses that interconnect these parts [6marks]

(b) Determine the memory location accessed by the following instructions. Assume CS = 2300, BX = 1000H, SI = 0100

i. MOV AL, [0100] [2marks]

ii. MOV CL, [BX + 0200] [2marks]

(c) By giving two examples in each case, explain the following types of instructions of an 8086 microprocessor.

i. Data transfer instructions [2marks]

ii. Arithmetic instructions [2marks]

iii. Branch instructions [2marks]

iv. Loop instructions [2marks]

v. Flag manipulation instructions [2marks]

QUESTION FOUR

(a) Using the 8086 instruction set, write instructions for the following operations [7marks]

i. Move the content of DX register into SS register

ii. Load 16-bit data from memory location offset address 0300 to AX

iii. Add 2345 to the contents of the AX register

iv. Subtract the content of the AX register from the AX register

v. Increment the contents of the CX register by one

vi. Multiply the content of AL by the content of CL

vii. Divide AX by the content of memory location represented by BX

(b) Explain the different areas where a microprocessor can be applied. [8marks]

(c) Explain briefly the FOUR types of segment registers in an 8086 microprocessor [4marks]

QUESTION FIVE

(a) Describe each of the following 8086 microprocessor addressing modes using an example in each case [6marks]

(i) Immediate

(ii) Stack

(iii) Register indirect

(b) The contents of different registers are AX=1000H, BX=2000H, SI=3000H, DI=4000H, BP=5000H, SP=6000H, CS=8000H, DS=1000H, SS=2000H, IP=7000H. Determine the 16-bit effective addresses and 20-bit physical address for the following addressing modes. Assume Offset (displacement) = 0500H

i. Direct addressing [2marks]

ii. Register indirect addressing [2marks]

iii. Based Indexed addressing [2marks]

iv. Based Indexed with displacement addressing [2marks]

(c) Write an 8086 program required to output the word in BX to I/O ports 8004H and 8005H. [6marks]

