60

(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2022/2023 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: 6TH DECEMBER, 2022 **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

QUESTION ONE

(a) Explain briefly the following parts of a microcomputer.

(i) Input devices [2marks]
(ii) Memory [2marks]
(iii) Output devices [2marks]
(iv) Arithmetic logic unit [2marks]

(b) Explain the sequence of operations in an arithmetic logic unit [5marks]

(c) Explain the any THREE key features and supported applications of the 7th generation microprocessors. [6marks]

(d) Explain briefly the functions of the following special purpose registers
(i) Program counter [2marks]
(ii) Stack Pointer [2marks]
(iii) Flags registers [3marks]

(e) Write instructions for the following operations [4marks]

i. Move the content of DX register into SS register
ii. Subtract immediately 1000 from memory with offset address 0100H
iii. Compare 16-bit immediately available data (4567H) from the AX register
iv. Multiply the content of AX by the content of CX

QUESTION TWO **[20marks]]**

(a) Explain any THREE addressing techniques in an 8086 microprocessor. [6marks]

(b) Using 8085 instruction set, write an assembly language program to perform the following operations [5marks]

i. Transfer data from accumulator to Register B respectively
ii. Load FFH in Register C
iii. Load HL register pair by the data 8150H
iv. Load the content of memory location 8100H in the accumulator
v. Store the content of accumulator in 8001H location

(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 **[20marks]**

(a) Determine the addressing modes of the following instructions. [6marks]
i. MOV CX, BX
ii. MOV BX, 1234

iii. MOV AX, [SI]
iv. MOV [Offset Address], 2345
v. MOV CX, [BX+SI]
vi. MOV AX, [BX+SI+1234]

(b) Differentiate between the following
i. Machine language and assembly language [2marks]
ii. Compiler and interpreter [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 **[20marks]**

(a) Using the 8086 instruction set, write instructions for the following operations [7marks]
i. Copy a byte from the port address 03 to the AL register
ii. Push the content of AX register on to the stack
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. Output the content of accumulator to port address 01
vii. Divide AX by the content of memory location represented by BX

(b) Explain briefly the functions of the following system buses in an 8086 microprocessor
i. Data bus [2marks]
ii. Control bus [2marks]
iii. Address bus [2marks]

(c) Differentiate between Maximum and Minimum modes of 8086 Microprocessor [6marks]

QUESTION FIVE

(a) State ANY FOUR advantages of memory segmentation [4marks]

(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) By giving ANY TWO examples in each, explain briefly the following registers of an 8086 microprocessor
i. Data registers [4marks]
ii. Pointer and Index registers [4marks]