



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FOURTH YEAR EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN
ELECTRICAL AND ELECTRONICS ENGINEERING

EEE 406: MICROPROCESSOR SYSTEMS AND APPLICATIONS

DATE: 15/6/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS.

Answer **QUESTION ONE** and **any other TWO**.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain what the following instructions do or whether they valid or not:
- MOV ES,DS
 - MOV BL,DX
 - MOV CS,AX
 - MOV AL,BL
 - LEA AX,NUMB
 - LEA EAX,NUMB
 - LDS DI,LIST
 - LDS EDI,LIST1
 - MOV CH,CL
 - MOV R8B,CL
 - MOV R8B,CH
 - MOV AX,CX
- (5 marks)
- b) Draw the address-control unit of the bus interface unit of the 8086 microprocessor and describe its components. (7 marks)
- c) Classify and discuss the three general types of addressing modes in the 8086 microprocessor. (8 marks)
- d) What are the features of the 80186 microprocessor? (5 marks)
- e) Draw the timing diagram of the 80186 microprocessor. (5 marks)

QUESTION TWO (20 MARKS)

- a) What is an instruction queue? (2 marks)
- b) Explain the instructions (i) LDS (ii) PUSHF (iii) TEST (iv) CLD (2 marks)
- c) What is the effect of executing the instruction?

MOV CX, [SOURCE_MEM]

Where SOURCE_MEM equal to 2016 is a memory location offset relative to the current data segment starting at address 1A00016. (3 marks)

- d) The 8086 includes four 16-bit data registers (AX, BX, CX and DX). These registers can be used in arithmetic or logic operations and as temporary storage. The most/least significant byte of each register can also be addressed directly (e.g. AL is the LS byte of AX, CH is MS byte of CX). What is the special purpose of each of these registers? (4 marks)
- e) Arithmetic and logic instructions can be performed on byte and 16-bit values. Write down the instructions that accomplish the following: (6 marks)
- Add immediate operand to a value in a register or memory
 - Add contents of BX to those of AX, results in AX
 - Add two registers with carry, $(AX) + (BX) + (CF) \rightarrow (AX)$
 - Add register and memory with carry, $(DS:DI) + (AX) + (CF) \rightarrow (DS:DI)$
 - Subtract an immediate operand from value in a register or memory
 - Subtract values in two registers, $(AX) - (BX) \rightarrow (AX)$
 - Subtract value in register from value in memory, $(DS:DI) - (AX) \rightarrow (DS:DI)$
 - increment BX
 - compare (subtract and set flags but without storing result)
 - mask in LS 4 bits of AL AND AL, 0FH
 - set MS bit of CX
 - clear AX
- f) In form of a table, give a summary of operation and features of LEA, LDS and LES. (3 marks)

QUESTION THREE (20 MARKS)

- a) What are the flags in 8086? Briefly explain them. (4 marks)
- b) State and explain the two main categories of interrupts in 8086. Which interrupts are generally used for critical events? (3 marks)
- c) The original contents of AX, BL, word-sized memory location SUM, and carry flag CF are 1234H, ABH, 00CDH, and 0H, respectively. Describe the results of executing the following sequence of instructions:
- ADD AX, [SUM]
- ADC BL, 05H
- INC WORD PTR [SUM] (6 marks)
- d) Draw a block diagram of the 8086-microprocessor architecture. (4 marks)
- e) What is an instruction pointer? (3 marks)

QUESTION FOUR (20 MARKS)

- a) State and describe the different types of segment registers in 8086 microprocessors. (7 marks)
- b) Explain the following software interrupt instructions:
- INT-Interrupt Instruction with Type number Specified
 - INT3-Break Point Interrupt Instruction (7 marks)
- c) Data transfer in a microprocessor can be classified as Microprocessor controlled or Device Controlled like DMA. Microprocessor controlled data transfer can further be divided into two categories namely; Programmed I/O and Interrupt Driven I/O. Explain what you understand by Programmed I/O and Interrupt Driven I/O data transfer. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Are there any instructions added to 80286 instruction set? If yes, mention and explain them. (4 marks)
- b) Write down and explain the addressing modes of 80386 with examples. (6 marks)
- c) Compare 8086, 80286, 80386, and Pentium in tabular form. (4 marks)
- d) Differentiate between hardware interrupts and software interrupt instructions in the 8086 microprocessor. (6 marks)