



Student Name: Student Number: Serial Number:

Final Exam, Second Semester: 2018/2019

Dept. of Computer Engineering

Course Title:	Microprocessors	Date:	01/06/2019
Course No:	0630313	Time Allowed:	2 hours
Lecturer:	Dr. Qadri Hamarsheh	No. Of Pages:	8

Instructions:

- **ALLOWED:** pens and drawing tools (**no red color**).
- **NOT ALLOWED:** Papers, calculators, literatures and any handouts. Otherwise, it will lead to the non-approval of your examination.
- **Shut down** Telephones, and other communication devices.

Please note:

- This exam paper contains 5 questions totaling 40 marks.
- Write your name and your matriculation number on every page of the solution sheets.
- All solutions together with solution methods (explanatory statement) must be inserted in the labelled position on the solution sheets.
- You can submit your exam after the first hour.

Basic notions: The aim of the questions in this part is to evaluate the required minimal student knowledge and skills. Answers in the pass category represent the minimum understanding of IA-32 Processor Architecture, Assembly Language Fundamentals: Instructions, Directives, Identifiers, Defining Data, Symbolic Constants, Data Transfers, Addressing, and Arithmetic instructions Addressing Modes, Conditional and Unconditional instructions, Stack, Pointers, Interrupts, Arrays and Procedures.

Question 1 Multiple Choices

(10 marks)

Identify the choice that best completes the statement or answers the question.

- Which microprocessor accepts the program written for **8086** without any changes?
 - 8085**
 - . 8087**
 - 8088**
 - None of the above**
- One of the following is **not** a valid segment address
 - 00000**
 - E0840**
 - 8CE90**
 - 8CE91**
- Which group of instructions do not affect the flags?
 - Arithmetic operations**
 - Branch operations**
 - Logic operations**
 - Data transfer operations**
- Which of the following will generate assembly **error**?
 - var1 BYTE 1101b, 22, 35**
 - var3 BYTE '\$','98778',**
 - var2 BYTE "ABCDE", 18**
 - None of the above**
- In the following data definition, assume that **X2** begins at offset **4000h**. What is the offset of the third value (**66**)?

X2	DWORD	37, 49, 51, 66, 77	
a)	4004h	b)	4008
c)	400A	d)	400C

- 6) _____ can be used as **indexed** registers in **real addressing mode**.
- BX, SI, DI**
 - SI, DI, , DS**
 - AX, SI, DI**
 - AX, BX, CX**
- 7) Which of the following is an **illegal** 8086 instruction?
- add ax, [si]**
 - dec [si]**
 - mov ax, [si]**
 - aDd bx, [si]**
- 8) From hardware viewpoint, the **overflow flag (OF)** can be implemented using the following logic expression:
- OF = CF AND MSB**
 - OF = CF OR MSB**
 - OF = CF XOR MSB**
 - None of the above**
- 9) Assume that the **AX** register contains the value **6521 H**. What will be the contents of **AX** after execution the instruction:
- CMP AL, AH**
- 65BC H**
 - BC21 H**
 - 4421 H**
 - 6521 H**
- 10) What will be the final value of **ax**?
- ```

mov ax, 6
mov ecx, 4
L1:
 inc ax
loop L1

```
- 11**
  - 10**
  - 9**
  - None of the above**

**Familiar and Unfamiliar problems solving:** the aim of the questions in this part is to evaluate that the student has some basic knowledge of the key aspects of the lecture material and can attempt to solve familiar and unfamiliar problems of Assembly Language Fundamentals: Instructions, Directives, Identifiers, Defining Data, Symbolic Constants, Data Transfers, Addressing, and Arithmetic instructions Addressing Modes, Conditional and Unconditional instructions, Stack, Pointers, Interrupts, Arrays and Procedures.

**Question 2**

(10 marks)

a) Explain the following terms:

(1.5 marks)

| Term                   | Description |
|------------------------|-------------|
| <b>Virtual memory:</b> |             |
| <b>Real mode</b>       |             |
| <b>Protected mode</b>  |             |

b) Discuss the following assembler directives with **examples**

(2.5 marks)

- DWORD**
- OFFSET**
- ENDP**
- EQU**
- SIZEOF**

**Solution**

c) Explain **Memory Models** that can be used in assembly language.

(3.5 marks)

**Solution**

d) Explain the various **types interrupts** in 8086 microprocessor. (2.5 marks)

**Solution**

**Question 3**

(10 marks)

a) Use the following data declarations.

(2 marks)

**.Data**

```

Goal Byte 1, 2, 3, 4
Mail DWord 12345678h, 34567890h
MailSize = lengthof Mail
Name Byte "Ahmed", 0

```

Indicate whether or not each of the following assembly code is **valid**:

| <b>N</b> | <b>Instruction</b>      | <b>Answer</b> |
|----------|-------------------------|---------------|
| 1)       | <b>CMP AL, GOAL</b>     |               |
| 2)       | <b>Sub SS, MailSize</b> |               |
| 3)       | <b>MOV [1234H] ,AX</b>  |               |
| 4)       | <b>xchg Goal, Name</b>  |               |

b) Where indicated, write down the values of the **Carry, Sign, Zero, and Overflow** flags after each instruction has executed:

(2 marks)

```

mov ax, 7FF0h
add AL, 10h ; CF = ----- SF = ----- ZF = ----- OF = -----

add AH, 1 ; CF = ----- SF = ----- ZF = ----- OF = -----

add ax, 2 ; CF = ----- SF = ----- ZF = ----- OF = -----

```

c) Use the following data declarations.

(2 marks)

```

X BYTE 10h,20h,30h,40h,50h, 60h, 70, 'a',0a
Y WORD 100h,200h,300h,400h
Z DWORD 10000h,20000h, 30000h, 40000h, 50000h, 60000h

```

Fill in the contents of the specified registers in the following code:

```

mov al,[X +3] ; AL = -----

mov ax,[Y+2] ; AX = -----

mov eax,[Z+TYPE arrayD]; EAX = -----
mov esi,4
mov edx, Z [esi*TYPE Z]; edx = -----

```

- d) What will be the final value stored in memory (**SUM**) after the execution of the following assembly code (2 marks)

```
.DATA
 NUMBERS SByte 3, -1, 4, 2, 5, 9, -2, -7
 SUM SByte ?
.CODE
.STARTUP
MOV SI, OFFSET NUMBERS
MOV AX, 0H
MOV CX, 4
L1:
 MOV BL, [SI]
 ADD AL, BL
 ADD SI, 2
LOOP L1
MOV SUM, AL
```

*Solution*

- e) What exactly will be displayed by the following assembly program? (2 marks)

```
INCLUDE Irvine32.inc
.DATA
 X DWORD 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
.CODE
MAIN PROC
 mov eax, X
 call WriteHex
 call CrLf
 mov eax, [X]
 call WriteHex
 call CrLf
 mov esi, 8
 mov eax, X [esi]
 call WriteHex
 call CrLf
 mov esi, OFFSET X
 mov eax, [esi]
 call WriteHex
 call CrLf
 EXIT
MAIN ENDP
END MAIN
```

*Solution*

**Question 4**

(4 marks)

Write a complete assembly program that computes the following equations

$$Y = X1 + X2 - C$$

$$Z = X3 + X4$$

In your code:

- ❖ Declare the following uninitialized variables:
  - **2-byte** signed integers: **Y, X1, X2** .
  - **2-byte** unsigned integers: **Z, X3, X4**.
- ❖ Declare the constant symbolic **C** and assign it the value **200**.
- ❖ In code section, assign variables **X1=FFh, X2=-10, X3=555, X4 =100**
- ❖ Compute **Y = X1 + X2 - C** and **Z = X3 + X4**.
- ❖ Assume that **real Addressing-mode** is used.
- ❖ Use **one segment** for both code and data sections.

**Solution**

**Question 5**

**(6 marks)**

Write an Assembly Language program to **compare** two strings and **display** if they are equal.

The program should:

- Enter two strings (**100** characters for each string) from keyboard.
- Display the message "**Strings are equal**" when the strings are equal and the message "**Strings are not equals**" otherwise.
- Use **Protected Mode Programming**.
- Use **Indirect Addressing Mode**.
- Use **Irvine32** library for input and output.

***Solution***

**Good Luck**