Philadelphia University

Faculty of Engineering

Student Name:	
Student Number:	
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Final Exam, First Semester: 2018/2019
Dept. of Computer Engineering

Course Title:	Microprocessors	**Date:**	21/01/2019
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 7 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, Arrays and Procedures.*

Question 1 Multiple Choices *(10 marks)*

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

1) The first processor that includes **real mode** in the Intel microprocessor family was ----------

a) 8085 **b) 8086**
c) 80286 **d) 80386**

2) Which of the following is an **invalid** instruction?

a) add dx,dx **b) MOV AX, CS**
c) sub bar,5 **d) MOV AL, DI**

3) The **directive** that can be used to declare variables to store binary-coded decimal numbers (packed BCD Integers) is ----------

a) SWORD **b) REAL10**
c) QWORD **d) TBYTE**

4) The variable definition **smallArray byte 2Ch, 5 DUP ("exam")** will reserve ------- bytes of memory.

a) 21 **b) 26**
c) 6 **d) None of above**

5) The output of the linker (**LINK** command) is stored in a file with the extension

a) .lis **b) .obj**
c) .lnk **d) .exe**

6) What will be the values of the **Sign**, and **Zero** flags after the following instructions have executed?

```
mov ax,620h
sub ah,0F6h
```

a) S=0,Z=1 **b) S=0,Z=0**
c) S=1,Z=0 **d) S=1,Z=1**

7) The conditional branch instruction **JNS** performs the operations when if __

a) ZF =0 **b) PF=0**
c) SF=0 **d) CF=0**

8) The instruction **TEST** is most similar to----------

a) OR **b) AND**
c) XOR **d) NOT**

9) The interrupt vector for **INT 17H** is stored in memory at:

a) 0005CH **b) 00068H**
c) 000C5H **d) 00017H**

10) Which of the following are performed when an **interrupt** occurs:

(I) FLAGS register is pushed to the stack
(II) CS register is pushed to the stack
(III) IP register is pushed to the stack

a) (I) and (II) and (III) **b) (I) and (II) only**
c) (II) and (III) only **d) (I) and (III) only**

Question 2 *(6 marks)*

a) **Explain 8086 flag register?** *(3 marks)*

Solution

b) **What is the use of Interrupt vector table of 8086 microprocessor?** *(2 marks)*

Solution

c) **What is an instruction queue? Explain?** *(1 mark)*

Solution

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, Arrays and Procedures.*

Question 3 ***(4 marks)***

Write instruction(s) to perform the following tasks:

1)	**Multiply AX by 5**	
2)	**Three different instructions that will clear the contents of register CL**	
3)	**Jump to label 'HELP' if AX is negative**	
4)	**sets (1) the right most five bits of DI without changing the remaining bits of DI.**	

Question 4 *(6 marks)*

a) If we declare the three arrays **AW, BW**, and **CW** of words by *(3 marks)*

```
AW   DW   000Ah, 010Ah, 020Ah, 030Ah, 040Ah
BW   DW   000Bh, 010Bh, 020Bh, 030Bh
CW   DW   000Ch, 010Ch, 020Ch, 030Ch, 040Ch, 050Ch
```

Fill in the contents of the specified registers in the following code as **hex-digit** numbers:

```
mov  ax,   [BW + 2] ;        ax = _____
mov  ax,   [AW + 20] ;       ax = _____
mov  ax,   [BW – 4] ;        ax = _____
mov  ax,   1234h
xchg ah,   al ;              ax = _____
MOV BX,    B372h
MOVZX      EAX,  BX ;        EAX= _____
MOV BX,    B372h
MOVSX      DX,   BL ;        DX= _____
```

b) Use the following data definitions: *(3 marks)*

```
Arr_Bytes          BYTE     0FFh,20h,0AAh,3Dh
Arr_Words          WORD     11h,3Bh,77h,22h,99h
Arr_DoubleWords    DWORD    1,2,3,4,5
Ptr_DoubleWords    DWORD    Arr_DoubleWords
```

Fill in the requested register values on the right side of the following instruction sequence:

```
mov esi, OFFSET Arr_Bytes

mov al, [esi] ;                          a. AL = ----------

mov al, [esi+3] ;                        b. AL = ----------

mov esi, OFFSET Arr_Words + 2

mov ax, [esi] ;                          c. AX = ----------

mov edi, 8

mov edx, [Arr_DoubleWords + edi] ;       d. EDX = ----------

mov edx, Arr_DoubleWords[edi] ;          e. EDX = ----------

mov ebx, Ptr_DoubleWords

mov eax, [ebx+4] ;                       f. EAX = ----------
```

Question 5 *(5 marks)*

Write an Assembly program to find number of times letter **'e'** exist in the string **'exercise'**. Store the count at memory variable **ans**.
In your code:

- Use **real mode** programming.
- Use **indirect addressing** memory mode.
- Terminate your program using the termination process of interrupt **INT 21**, function number **4Ch**.

Solution

Question 6 ***(3 marks)***

Consider the following **Boolean expression**:

$$\mathbf{IF}\ ((\mathbf{X} > Y)\ AND\ (Z < T))\ OR\ (A \neq B)\ THEN\ C = \mathbf{D}$$

Write an assembly language **code** to implement the above expression.
Assume that all variables are declared and of type **WORD**.

Solution

Question 7 *(6 marks)*

Write an Assembly program which separates **odd** and **even** numbers from given **10 8-bit data** stored in memory locations and store in different arrays and add them individual in Assembly Language.

Solution

Good Luck