National University of Computer & Emerging Sciences, Karachi

Fall 2017 CS-Department

MidTerm 1

20th September 2017, 9:00 am – 10am

Course Code: EE 213	**Course Name:** Computer Organization and Assembly Language
Instructor Name / Names: Nadeem Kafi, Mehwish Amjad, Muhammad Danish Khan	
Student Roll No: Nadeem Kafi	**Section No:**

Instructions:

- Attempt all questions, containing equal marks. Return the question paper.
- Attempt Q1 on page 1, Q2 on page 2, Q3 on page 3, ..., and Q6 on page 6 of your answer copy. Use page 7 onwards for "rough work".
- Use pencil to write neat and readable code with necessary comments.
- There are **5 questions and 2 pages.** Bonus question is optional.
- Make assumptions, if required, without contradicting any statement in the question paper.

Time: 60 minutes. **Max Points:** 50.

Q1 Answer the following questions:

a) Identify the addressing modes (type of operands) of the following instructions:

i. `MOV AX, BX`
ii. `MOV AX, 5`
iii. `MOV AX, VAR1`
iv. `MOV BX, [1005h]`
v. `MOV AX, [BX]`

b) Modify the following code snippet such that EAX contains 300 at label L2.

```
    MOV EAX,100
    MOV EBX, 0
    MOV ECX,0
L1: ADD EAX, EBX
    LOOP L1
L2: CALL DumpRegs
```

c) How the number CEF826F8h is stored in 1) big-endian order and 2) little-endian order.

d) Draw the "assemble-link-execute cycle" and number each step to show sequence of operations.

Q2 Given the code snippet below, assuming the given data segment starts at 00000002h, answer the following questions.

```
.data
var1 WORD 3 DUP (7,3, 7), 0
var2 BYTE 2 DUP ('COAL'), 'Spring',0
var3 DWORD 2DFC11h, 3FFCh
```

a) Draw neat memory layout for the given data section showing byte by byte addresses and contents.

b) What does the following instruction result in?

`MOV AX, WORD PTR var3`

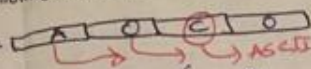
AX= FC11

c) What does **ESI** contain after the following instruction is executed?
MOV ESI, OFFSET var2+9

d) Write code that would swap second initializer of **var3** with second initializer of **var1**.

e) What does **EAX** contain when the following code is executed?

```
MOV ESI, OFFSET var1+9
MOV EAX, [ESI]
```



Q3 Identify and explain the type of error (if any) in the given instruction.

```
.data
ARRAY1 DWORD    50 DUP (19)
VAR1 BYTE 10
```

i. `MOV [BX], [SI]`
ii. `MOV EIP, 40`
iii. `MOV AX, [ARRAY1 + 1]`
iv. `INC [ESI]`
v. `MOV EAX, WORD PTR VAR1`

Q4 Draw a simplified CPU block diagram, and show steps describing execution of x86 instructions **ADD [89FCh], EBX**. Show related memory locations with addresses, registers, and other element inside the CPU.

Q5 Write assembly code snippet for the following C code, that produces same results.

```
int a, b=20, c=30, f;
for (a=100, a != 0; a--)
    b = c + a;
    f = b + 2;
```

Optional Bonus Question (5 points)

Note: Attempt Q6 only after fully attempting all other questions.

Q6 Assume the following data declarations.

```
.data
  string1 byte    "FAST-National University of Computer and Emerging Sciences ("
  string2 byte    "Department of Computer Science)"
```

The requirement is to append **string2** at the end of **string1**, making **string1** a null terminated string. Use your knowledge of assembly language to fulfill this requirement while writing minimum amount of assembly code. Use any assembler directive we have covered so far. Explain your code and concepts precisely. Unclear and half cooked answers will get no marks.

BEST OF LUCK!