Question 1. Add the following hexadecimal numbers.

FCE7 , 182A

The result has to be hexadecimal. Show your work. You are not allowed to make any number system conversion during the process. (e.g. hexadecimal to binary)
Answer format:
line 1 : carry
line2: first number
line3: second number
line4: Answer
Example Answer: (This is just an example to show the answer format. Carry and addition might not be correct.)
0120 (carry)
FA21 (first number)
14A6 (second number)
A234 (Answer)

Answer:
1110 (carry)
FCE7. (1st number)
182A (2nd number)
11511. (result)

Question 2. Read the following assembly instructions carefully.
mov eax, 10h
mov ebx, 11h
add ecx, eax
add ecx, ebx

What is content of the ecx register after you execute these four instructions. Justify your answer.

Answer: eax contains 10h, ebx contains 11h.
We add content of eax with content of ecx. The ecx register contains garbage value.
So the result can be anything.

Question 3. Assuming 8-bit register is used. Calculate the following operation using two's complement method.

−121−2

Step 1

Convert 121 into binary.

	Quotient	Remainder
121/2	60	1
60/2	30	0
30/2	15	0
15/2	7	1
7/2	3	1
3/2	1	1
1/2	0	1

121 (Dec) = 01111001 (Bin) in 8 bit

1's complement of 121 = −10000110

+1

2's " " " = 10000111 (−121)

Step 2

2 in 8bit = 0000 0010

1's complement of 2 = 1111 1101

+1

2's " " " = 1111 1110 (−2)

-121 : 10000 111

-2 : 1111 1110 (+)

1) 1000 0101

8 bit.

MSB is 1

signed number

2's complement of 1000 0101

0111 1010

+1

0111 1011

$(2^7*0)+(2^6*1)+(2^5*1)+(2^4*1)+(2^3*1)+(2^2*0)+(2^1*1)+(2^0*1)$

$= 64 + 32 + 16 + 8 + 2 + 1$

$= 123$

so **-123** Ans

Question 4. Identify the instruction execution cycle for the following instruction:

sub v1, bl

Answer:

1. First CPU has to fetch the instruction from the memory.
2. CPU decodes the instruction by looking at its binary pattern
3. CPU fetches the operand from the register
4. CPU executes the operation
5. CPU stores the results to output operand

Question 5. what will be the values of register CL and the specified flags after executing the following instructions:

```
mov CL,40h      ;assume the values are signed integer
add  CL,40h     ;assume the values are signed integer
```

CL= , SF= , ZF= , OF = , CF=

Note: 0 means a flag is clear and 1 means it is set.

Answer:

CL = 80h
SF = 1
ZF= 0
OF= 1
CF = 0

Question 6. Write an assembly code to compute the following expression:

y=(A−C)+(B+2)

where y is 16-bit register, and A, C and B are 16-bit memory variables and A = -14, C = 10 and B = -1

Answer:

```
.data
        A SWORD -14
        C WORD 10
        B SWORD -1

.code
        Mov ax, A
        Sub ax, C

        Mov bx, B
        Add bx, 2
        Add ax, bx
```

Question 7. (a)What are the steps of reading a value from a memory?

(b) Let's assume that each step takes 1 clock cycle to execute. The processor clock speed is 1.2 GHz. How long it takes to read a value from memory in micro-second?

(1 second=10^6 microsecond)

Answer: (a)

1. Place the address of the value in the address bus
2. Assert processor's read pin
3. Wait 1 clock cycle for memory chip to respond
4. Copy the data from data bus to destination operand

(b) 4 steps take 4 clock cycles.
The processor clock speed is 1.2 GHz = 1.2 x 10^9 Hz.
That means, Processor can make 1.2 x 10 ^9 clock cycles per second.

1.2 x 10 ^9 clock cycles are generated in 1 second

4 clock cycles are generated in $\frac{4}{1.2\times10\text{^}9}$ seconds or $\frac{4\times10\text{^}6}{1.2\times10\text{^}9}$ micro seconds or 3.33 *10^-3 micro-second.

4 steps take 4 clock cycles = 3.33 *10^-3 micro-second.

Question 8. What is the difference between symbolic constant and memory variable in assembly language?

Answer: See book section 3.5

Question 9. Read the following code segment carefully.

count = 200
array DWORD count DUP(100)
arraySize= (count *4)/4

arraySize contains the size of the array. Does the line 3 compute array size correctly? Is it a correct way to do it? Justify your answer.

Answer: It initially produces the correct array size. However, if you want to add or remove item from the array, it might not provide correct answer.

Question 10.
Consider the following code:

```
 .386
.model flat, stdcall
.stack 4096

ExitProcess PROTO, dwExitCode : DWORD

.data
aVal SDWORD -6
bVal SWORD 19h
cVal DWORD 17h

.code
mov edx, aVal
add edx, edx
mov eax, 0FFFFFFFFh
mov ax, bVal
sub edx, eax
```

Show the content of edx and eax after executing each instruction in Hexadecimal.

Answer:

Step - 1

2's complement of -6 : (32 bit).

6 in Hex: 00 00 00 06 (32 bit).

1's complement : FF FF FF F9

2's complement : +1

FFFFFFFA

After mov edx, aval.

edx = FFFF FFFA
eax = garbage

step-2 add edx, edx

```
  1 1 1 1 1 1 1
  FFFF FFFA
  FFFF FFFA   (+)
1 FFFF FFF4
```

edx = FFFF FFF4
eax = garbage

step 3 mov eax, 0FFFFFFFFh

edx = FFFF FFF4
eax = FFFF FFFF.

step 4 mov ax, bval

edx = FFFF FFF4
eax = FFFF 0019

Step 5 sub edx, eax

2's complement of eax: FFFF 0019

↓

0000 FFE6

+1

0000 FFE7

edx: FFFF FFF4

−eax: 0000 FFE7

1)0000 FFDB

edx : 0000 FFDB

eax : FFFF 0019