Q1: For the following MCQs, circle one correct answer.

(a) Elements of an information system architecture are:
  (1) Hardware & Software.
  (2) Data & People.
  (3) Networks.
  (4) All of the above.

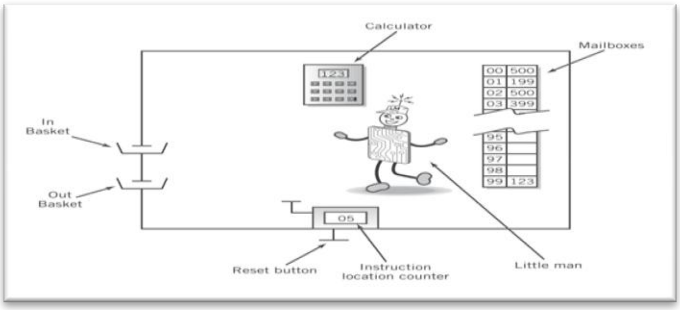
(b) In the LMC, the instruction SUB is given the following code:
  (1) 1
  (2) 2
  (3) 3
  (4) 4

(c) Assembly language comes under the category of:
  (1) First generation programming language.
  (2) Second generation programming language.
  (3) Third generation programming language.
  (4) Forth generation programming language.

(d) In O-Address Machines , all operands for binary operations are implicit on the:
  (1) Accumulator.
  (2) Queue.
  (3) Stack.
  (4) Linked List.

(e) In the Von Neumann Architecture, the following 'bus access' controls which data gets written to the bus:
  (1) 5
  (2) 6
  (3) 7
  (4) 9

Q2: On the following diagram, explain the Five different parts of the Little Man Computer:



Input and output from and to the user.   Add, subtract, multiply and divide numbers.

Memory holding both programs and data.   Control unit coordinating the other components.

Address (mailbox) of the next instruction to be executed.

Q3: Use 8-bits (including the sign) to solve the following problems:

a) Represent the value $(-23)_{10}$ in binary, using the signed magnitude and 2's complement method.

$(23)_{10} = (00010111)_2$

Signed magnitude: $(-23)_{10} = (10010111)_2$

2's complement method: $(-23)_{10} = (11101001)_2$

b) Perform the subtraction of $(25 - 23)_{10}$ using 2's complement method.

$(25)_{10} = (00011001)_2$

$11111 \quad 1$

00011001

$+11101001$

100000010

$(00000010)_2 = (2)_{10}$

Q4: Convert the following number $(\mathbf{00010011})_2$ to:

a) Decimal.

$(00010011)_2 = 0 \times 2^7 + 0 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 0 + 0 + 0 + 16 + 0 + 0 + 2 + 1 = (19)_{10}$

b) Hexadecimal.

$(00010011)_2 = (0001\ 0011)_2 = (13)_{16}$

c) Octal.

$(00010011)_2 = (000\ 010\ 011)_2 = (023)_8$

Q5: Given the equation below, find out its instruction set using the 2-Address Machine architecture as well as the memory references. Write your answer in the boxes provided.

$$a = (a + b) - (c * a)$$

Note: use T1 and T2 as source and destinations.

a) Using memory:

Code	Memory References
MOVE T1, a	2
ADD T1,b	3
MOVE T2, c	2
MULT T2, a	3
SUB T1,T2	3
MOVE a, T1	2
Total Memory References	15

b) Using registers:

Code	Memory References
MOVE T1, a	1
ADD T1,b	1
MOVE T2, c	1
MULT T2, a	1
SUB T1,T2	0
MOVE a, T1	1
Total Memory References	5

Q6: By completing the table below, translate the following source code into a machine code using the Assembly Language:

var sum=0;//initial value

var count=20;//initial value

begin

while count >0 loop

sum=sum+count;

count=count-1;//decrement count

end loop

return sum;

end

Note1: some of the address locations have been set for you.

Note2: The number of rows in the table below might be more than you need.

Box	Code	Assembler
01	518	LDA COUNT
02	125	ADD twenty
03	715	BRZ
04	522	LDA SUM
05	122	ADD COUNT
06	322	STO COUNT
07	518	LDA COUNT
08	204	SUB 1
09	318	STO COUNT
10	601	BR
11	522	LDA SUM
12	902	OUT
13	000	HLT
14		
15		
16		
17		