SIES Graduate School of Technology

Subject : DLCOA

Roll No.: 119A1076

Assignment No. 1

Date : 09/10/2020

Q1)

a) 1 10000010 00100000000000000000000

31 sign bit | 23-30 exponent | 0-22 Fractions

Sign bit = 1

∴ number is negative (-1)

Exponent = $(10000010)_2 = (130)_{10}$

To find exponent, subtracting bias from expression

Exponent' = Exponent - bias

= 130 - 127

= 3

Fraction :-

$00100000000000000000000 = 1 \times 2^{-3}$

$= 0.125$

The number is

$(-1)(1 + \text{Fraction}) \times 2^{\text{exponent}'}$ $= (-1)(1 + 0.125) \times 2^3$

$= -9$

b) 0 01111110 00001100110011001100110

31 sign bit | 23-30 exponents | 0-22 function

Sign bit = 0

∴ Positive number (1)

Exponent

$(01111110)_2 = 126$

$e' =$ exponent - bias $= 126 - 127 = -1$

Fractions:-

$0000\,1100\,1100\,1100\,1100\,1100 = 2^{-5}+2^{-6}+2^{-9}+2^{-10}+2^{-13}+2^{-14}$
$+2^{-17}+2^{-18}+2^{-21}+2^{-22}$
$= 0.0499949232$

$(1)\times(1+\text{Fraction})\times 2^{e'} = 1\times(1+0.0499949232)\times 2^{-1}$
$= 0.5249949762$

∴ The number is 0.5249949762

c) $0\,|\,0000\,0000\,|\,1100\,1100\,1100\,1100\,1100\,110$

31 sign bit | 23-30 exponent | 0-22 fractions

Sign bit $= 0$
∴ The number is positive (1)

Exponent
$(1000\,0000)_2 = (128)_{10}$

$e' =$ Exponent − bias
$= 128 - 127 = 1$

Fractions:-
$1100\,1100\,1100\,1100\,1100\,110 = 2^{-1}+2^{-2}+2^{-5}+2^{-6}+2^{-9}+2^{-10}+2^{-13}+2^{-14}$
$+2^{-17}+2^{-18}+2^{-21}+2^{-22}$
$= 0.7999999523$

$(1)\times(1+0.7999999523)\times 2^{1}$

$= 3.5999999405$

(Q2)

a) $(67)_8 * (21)_8$

$$\begin{array}{r} 67 \\ \times 21 \\ \hline 67 \\ 156\times \\ \hline 1647 \end{array}$$

$14-8=\underset{\text{Carry}}{1}\ 6$

$6\times2=12+1=13-8=\underset{\text{carry}}{1}\ 5$

$(67)_8 \times (21)_8 = (1647)_8$

b) $(D9)_H - (80)_H$

$$\begin{array}{r} D\ 9 \\ -\ 8\ 0 \\ \hline 5\ 9 \end{array}$$

$(D9)_H - (80)_H = (59)_H$

(Q3)

a) $(11)_{10} - (22)_{10}$

$(01011)_2 - (10110)_2$

1's of B = 01001
2's of B = 01010

A → 01011
2's of B → 01010
1010 ✱

∴ 2's of Sum = 01011 = -11

ii) $(33)_{10} - (44)_{10}$

$(100001)_2 - (101100)_2$

1's complement of 10110 → 01001

$$\begin{array}{r} 100001 \\ +\ 010011 \\ \hline 110100 \end{array}$$

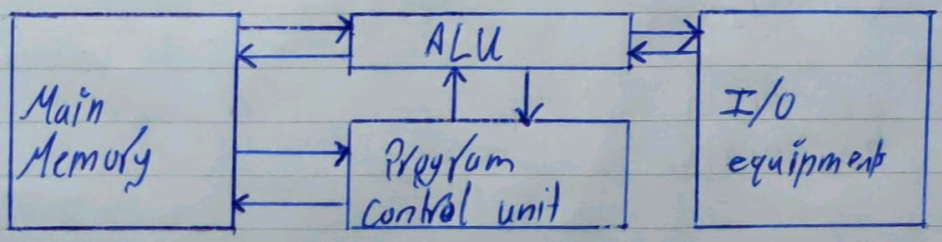
∴ 1's complement of sum = 001011 = −11

Q4) Explain Von Neumann Model

A) In 1946 Von neumann started with the design of 'new 'stored program computer' refered as IAS computer, at Princeton Institute of advanced studies

ii) The IAS wasn't completed till 1952 but still it is the prototype of all subsequent general purpose computers

Structure of IAS computer



Von Neumann Outlined the structure as:-

i) The computers need 2 ~~of~~ units for addition, subtraction, multiplication & division & for logical ops such as AND, OR, NOT, etc. Hence, computers need to have central arithmetic unit.

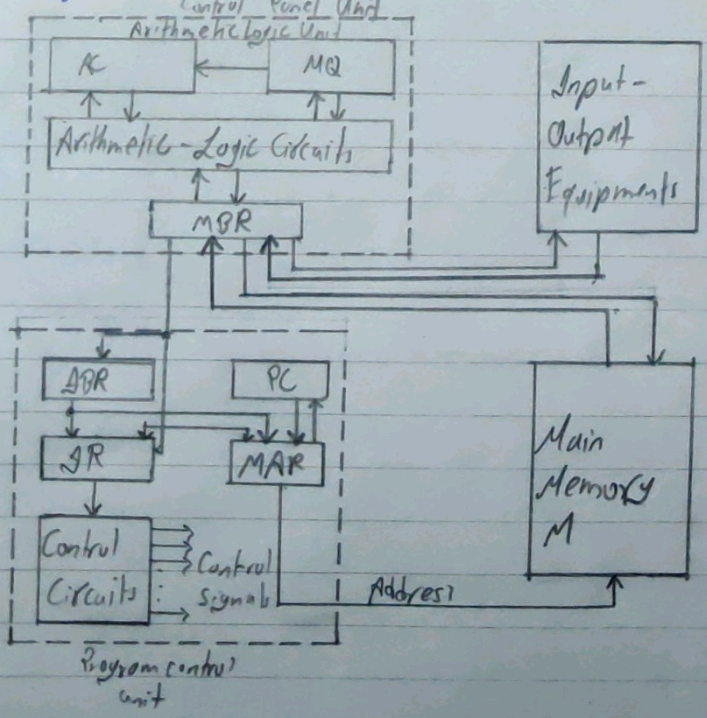
The computer needs the unit for decoding instructions & converting them into series of actions for execution of instructions. Hence control unit is ~~are~~ necessary

The ~~mem~~ memory is also needed to store the program & data (This itself is the basic idea of stored program ~~computer~~ computers) Since program is stored in the memory, the instructions will be fetched into computer in a specific sequence & will be executed

The input equipment is needed to get data into computer & output equipment is needed to send data out of computer

The memory of IAS ~~computer~~ consist of 1000 storage locations called as word, each of 40 bits. Both instructions & data are stored in these locations

The data is of 40 bits in which one bit is used for sign bit & remaining 39 for value



- Memory Buffer Register (MBR):- Used either to ~~store~~ receive a word from memory or contain a word ~~from~~ to be stored into memory. Also used to communicate with i/p & o/p
- Memory Address Register (MAR):- Used to provide address of mem. loc. @ which word is to be written or from which word/instrument to be fetched
- Instruction Register (IR):- used to contain 8 bit opcode instructions to be executed
- Instruction Buffer Register (IBR):- Used to hold right instructions from a word fetched temporarily
- Program Counter (PC) :- Contains address of next instruction pair fetched from memory
- Accumulator (AC) & Multiplier Quotient (MQ):- Used to hold the operands & results of ALU ~~temp~~ temporarily
- Control Circuits :- Used to generate necessary control signals to execute instructions ~~properly~~ ~~properly~~ properly.