Assignment : 2

1] Perform signed number multiplication of $8 * 9$ using booth's algorithm

$\Rightarrow$
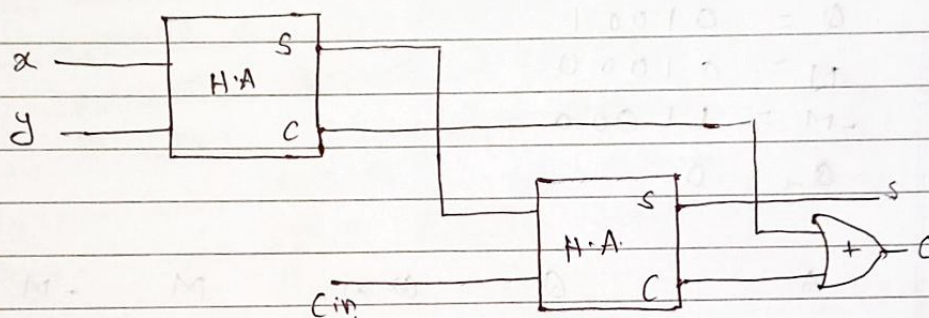A = 0 0 0 0 0
Q = 0 1 0 0 1
M = 0 1 0 0 0
-M = 1 1 0 0 0
Q_{-1} = 0

A	Q	Q_{-1}	M	-M	Acton
0 0 0 0 0	0 1 0 0 1	0	0 1 0 0 0	1 1 0 0 0	
1 1 0 0 0					$Q_0 Q_{-1} = 10$
1 1 0 0 0	0 1 0 0 1	0			A = A - M
0 1 1 0 0	0 0 1 0 0	1			ARS $A Q Q_{-1}$
0 1 1 0 0	0 0 1 0 0	1			$Q_0 Q_{-1} = 01$
0 1 0 0 0					A = A + M
1 0 1 0 0	0 0 1 0 0	1			ARS $A Q Q_1$
1 1 0 1 0	0 0 0 1 0	0			
1 1 0 1 0	0 0 0 1 0	0			$Q_0 Q_{-1} = 00$
0 1 1 0 1	0 0 0 0 1	0			ARS $A Q Q_-$
0 1 1 0 1	0 0 0 0 1	0			$Q_0 Q_{-1} = 10$
1 1 1 0 0 0					
0 0 0 1 0	0 0 0 0 1				
0 1 1 0 0 0	1 0 0 0 0	1			
0 0 1 0 0	1 0 0 0 0	1			ARS $Q_0 Q_{-1}$
0 0 0 1 0	0 1 0 0 0	0			

Product Available is $(0 0 0 1 0 0 1 0 0 0) = 72$.

2] Design full adder using two half addes and OR gate.
with expression

⇒ Full Adder using two half adder and OR Gate.

Expression is given as,

$$S = \bar{x}\,\bar{y}\,C_{in} + \bar{x}\,y\,\overline{C_{in}} + x\bar{y}\,\overline{C_{in}} + xy\,C_{in}$$

$$C_{out} = \bar{x}y\,C_{in} + x\bar{y}\,C_{in} + xy\,\overline{C_{in}} + xy\,C_{in}$$

3] Explain instruction format and instruction cycle

⇒ Instruction format:
Every instruction consist of two field.
i] opcode. (specifus operation to be pertarmd
ii] Operand (it is data on which operation is to be performed)

Depending upon no. of operands in instruction
we have following instruction format.
a] Zero operand instruction :-
these instruction have implicit operations thereby,
then instruction does not need to specify th.
Operands
For ex :-   ADD
          ADD ⇒ st(0) ← st(0) + st(1)

(b) one operand instruction :-

Some instruction needs to specify only second. operand & First operand is implicit such instruction are one operand Instruction.

For ex :   general register

$$ADD \; B$$

$$(A) \leftarrow (A) + (B)$$

Accumalator
register

Above example of 8085 intruction

$$B, C, D, E, H, L \Rightarrow 8 \; bits$$

(c) Two operand instruction :-

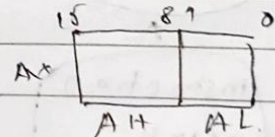There are some instruction which need to specify. both operand such instruction are two operand instruction.

Given example is of 8080 instructions

for example :-

ADD   AL , BL   8-bit :- AL, AH, BL, BH, CL, CH.

$$(AL) \leftarrow (AL) + (BL)$$

ADD   AX , BX.

$$(AX) \leftarrow (AX) + (BX)$$ AX

15	8 7	0

AH   AL.

(d) Three operation instruction

op code   Address 1 , Address 2,   Address 3.

ADD   A₁ , A₂ , A₃

ADD   [2021] , [2023]

$$[2021] \leftarrow [2021] + [2023]$$

2021	
2022	05
2023	04

Above instruction uses three address
First two addresses are for two operand on which
operation is to be performed. And third address
is for next instruction to executed. This format of
instruction is used for instruction sequencing.

Instruction cycle :-
It is the time required by microprocessor to
execute the instruction, it consists of two cycles
Fetch cycle: , and execute cycle.

Execute cycle :-
this time is used to decode and execute the
instruction

Fetch cycle :-
This is time required to fetch the opcode and
operands of a instruction