NIRMA UNIVERSITY
INSTITUTE OF TECHNOLOGY
NAAC ACCREDITED 'A' GRADE

NIRMA UNIVERSITY
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COMPUTER ARCHITECTURE(2CS504) -

FLOATING POINT MULTIPLIER USING PIPELINE

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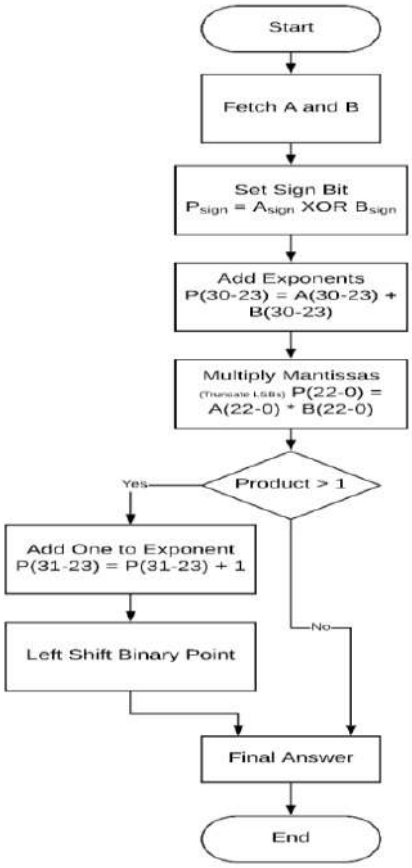
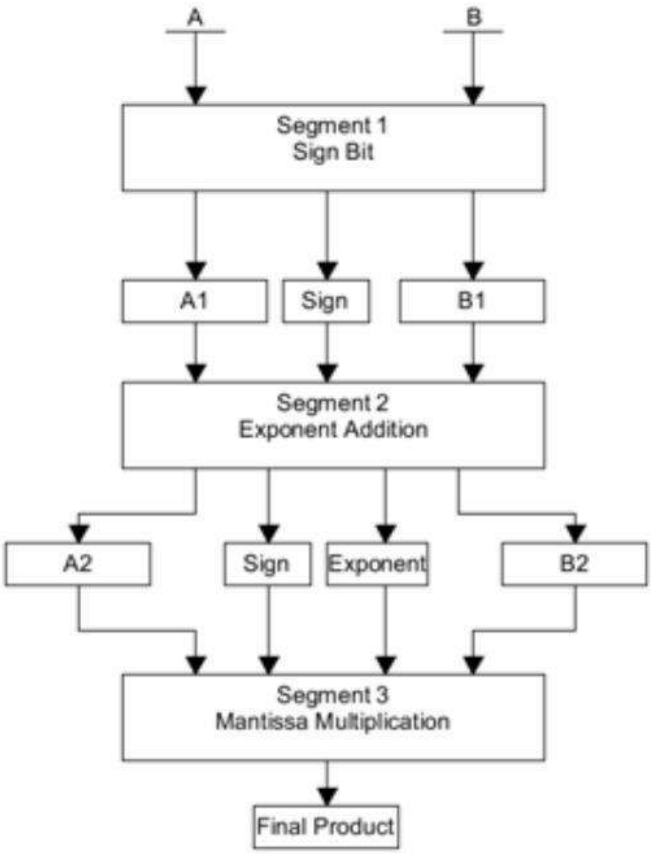
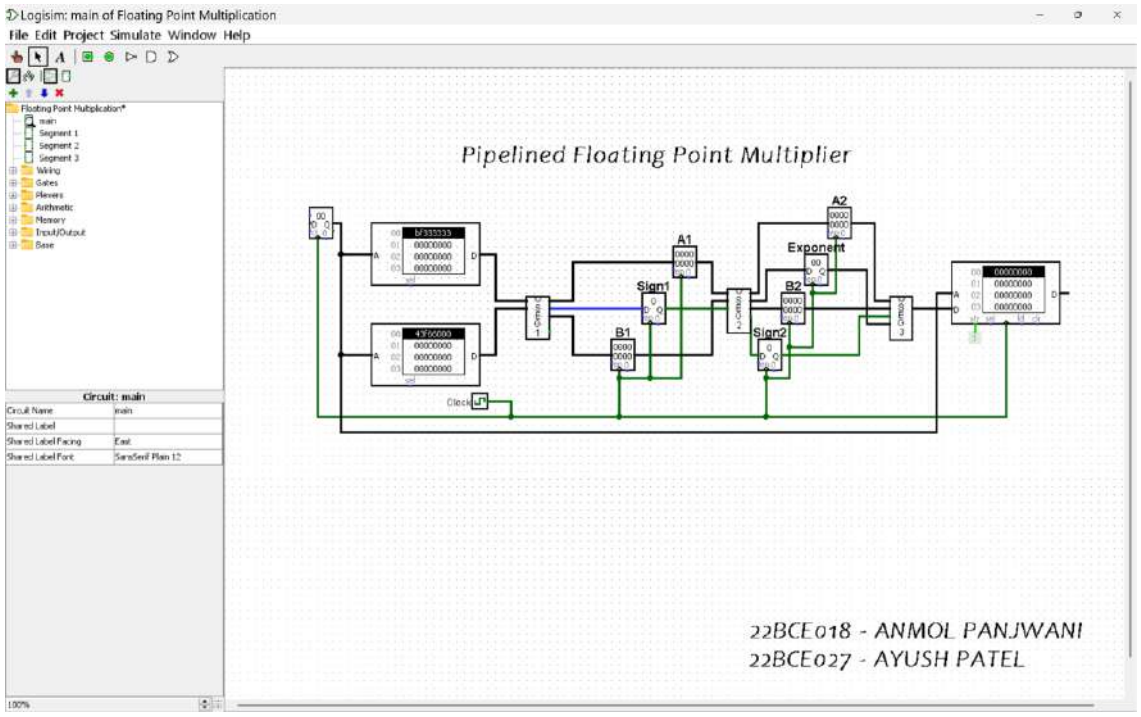
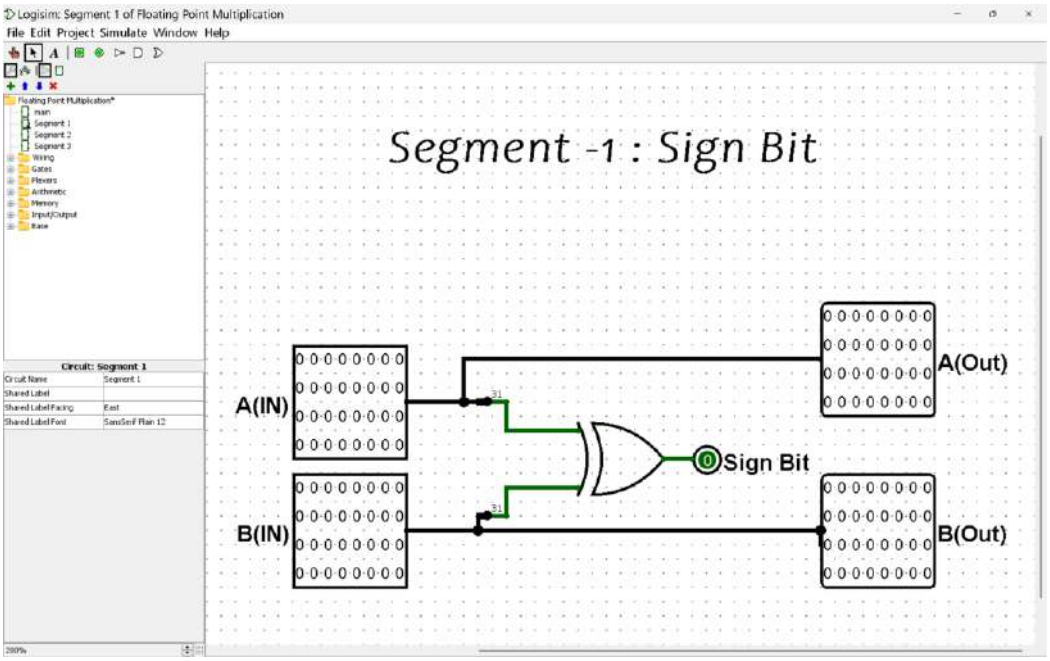
❖ FLOWCHART:

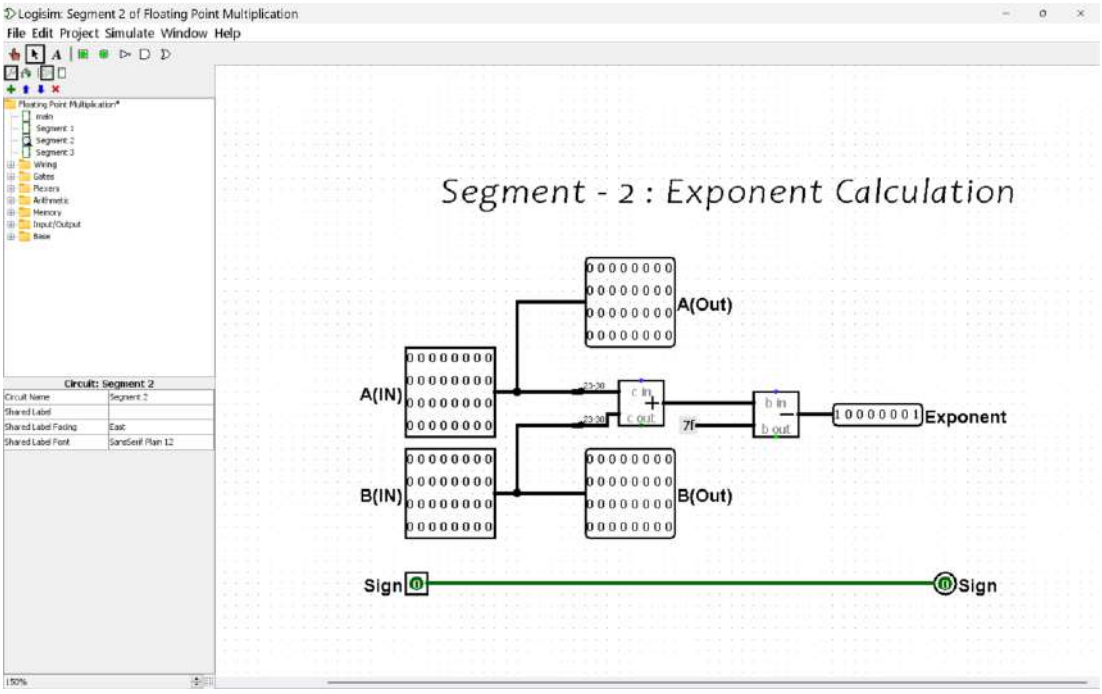


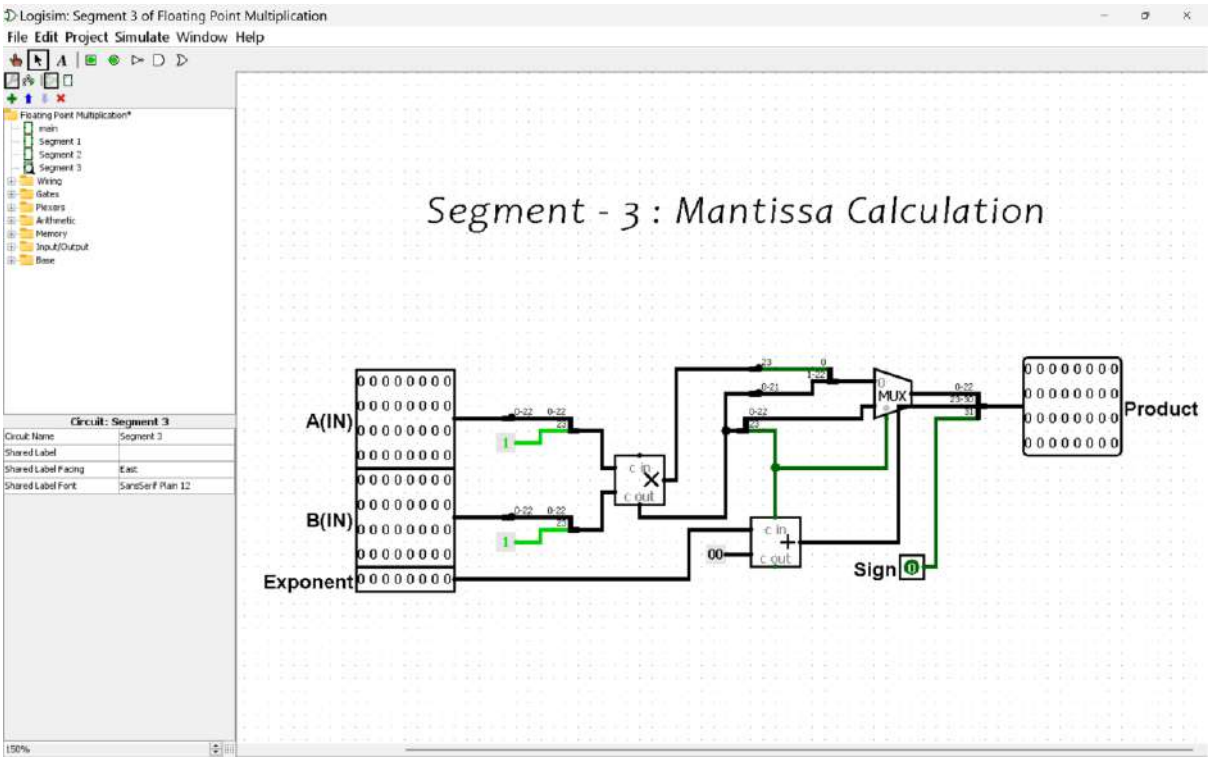


❖ LOGIC CIRCUIT:

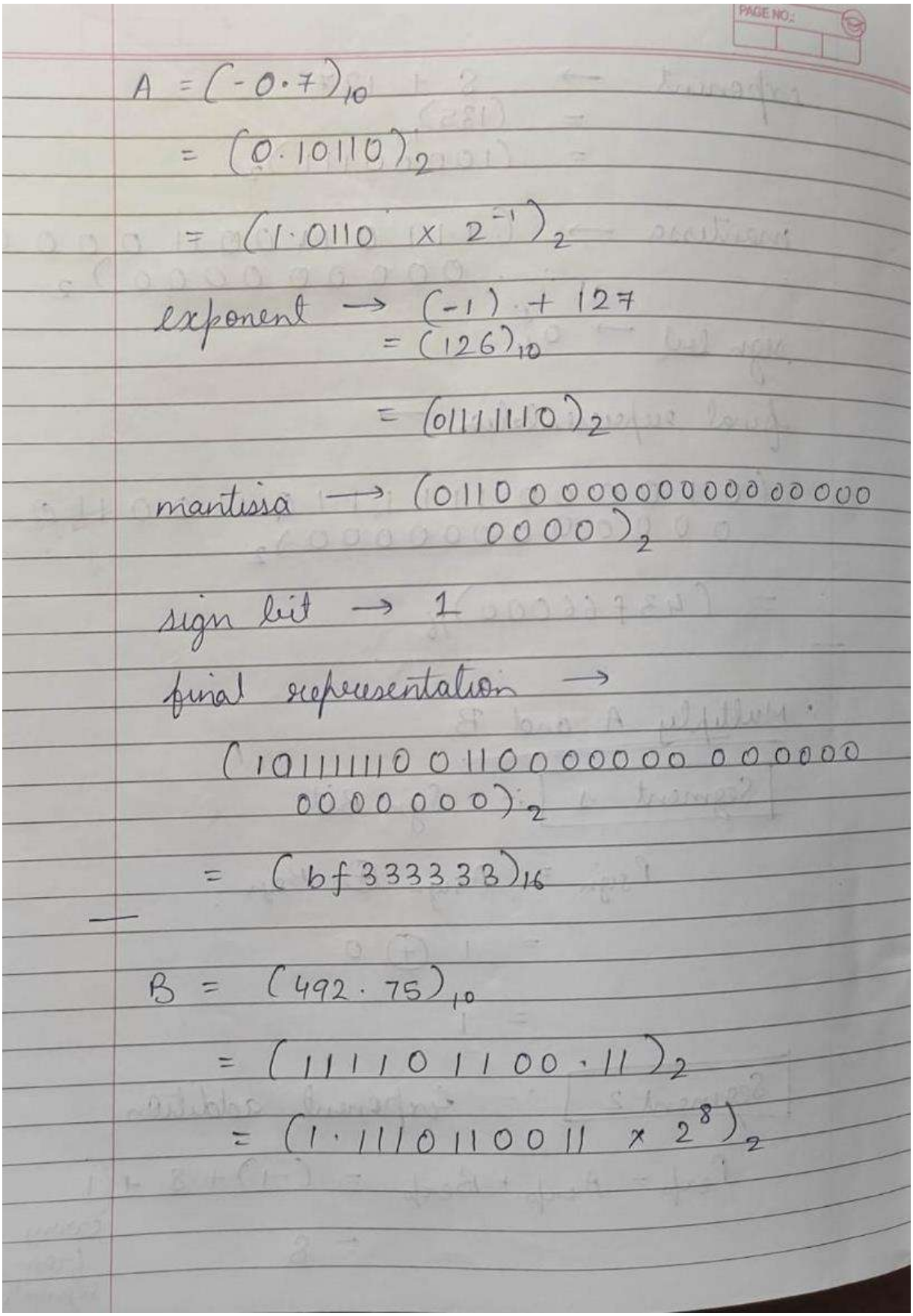



Logisim: Segment 1 of Floating Point Multiplication
File Edit Project Simulate Window Help
Segment -1 : Sign Bit
A(IN)
B(IN)
A(Out)
B(Out)
Sign Bit
Circuit: Segment 1


Logisim: Segment 2 of Floating Point Multiplication
File Edit Project Simulate Window Help
Segment - 2 : Exponent Calculation
A(IN)
B(IN)
A(Out)
B(Out)
Exponent
Sign
Sign
Circuit: Segment 2


Logisim: Segment 3 of Floating Point Multiplication
File Edit Project Simulate Window Help
Floating Point Multiplication*
main
Segment 1
Segment 2
Segment 3
Wiring
Gates
Plexers
Arithmetic
Memory
Input/Output
Base
Circuit: Segment 3
Circuit Name
Segment 3
Shared Label
Shared Label Facing
East
Shared Label Font
SansSerif Plain 12
150%
Segment - 3 : Mantissa Calculation
A(IN)
B(IN)
Exponent
MUX
Product
Sign
c in
c out
00

❖ DRY-RUN CALCULATION:



$A = (-0.7)_{10}$

$= (0.10110)_2$

$= (1.0110 \times 2^{-1})_2$

exponent → $(-1) + 127$

$= (126)_{10}$

$= (01111110)_2$

mantissa → $(0110\ 0000\ 0000\ 0000\ 0000\ 0000)_2$

sign bit → 1

final representation →

$(10111111\ 01100000\ 00000000\ 00000000)_2$

$= (bf333333)_{16}$

—

$B = (492.75)_{10}$

$= (111101100.11)_2$

$= (1.11101100\ 11 \times 2^8)_2$

exponent → 8 + 127

= $(135)_{10}$

= $(10000111)_2$

mantissa → $(111\,0\,1.1\,00\,11\,0000\,0000\,0000\,0000)_2$

sign bit → 0

final representation →

$(0\,10000111\,11101100110\,0000\,0000\,0000\,0000)_2$

= $(43f66000)_{16}$

—

Multiply A and B →

Segment 1 :- Sign Bit

$P_{sign} = A_{sign} \oplus B_{sign}$

$= 1 \oplus 0$

$= 1$

Segment 2 :- Exponent addition

$P_{exp} = A_{exp} + B_{exp} = (-1) + 8 + (1)$ carry from segment (3)

$= 8$

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Segment 3 :- Mantissa multiplication

= mantissa of A * Mantissa of B

= $(01100000000000000000000)_2 \times (11101100110000000000000)_2$

= (1) $(01011000111011001100110)_2$
Carry

final representation →
$(11000011101.01100011101100110011 0)_2$

hexadecimal representation →

$(C3AC7666)_{16}$

decimal representation →

= $(1.01011000111011001100110 \times 2^8)_2$

= $(101011000.111011001100110)_2$

= $(-344.925)_{10}$