Vidyavardhini's College of Engineering and Technology
Department of Artificial Intelligence & Data Science

AY: 2024-25

Class:	SE	Semester:	III.
Course Code:	CSC304	Course Name:	DLCA.

Name of Student:	SHARVARI ANAND BHONDEKAR.
Roll No. :	06.
Assignment No.:	02.
Title of Assignment:	APPLY THE ARITHMETIC ALGORITHMS TO SOLVE ALU OPERATIONS.
Date of Submission:	16/8/24
Date of Correction:	16/8/24.

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Completeness	5	4
Demonstrated Knowledge	3	3
Legibility	2	2
Total	10	9

Performance Indicator	Exceed Expectations (EE)	Meet Expectations (ME)	Below Expectations (BE)
Completeness	5	3-4	1-2
Demonstrated Knowledge Legibility	3	2	1
Legibility	2	1	0

Checked by

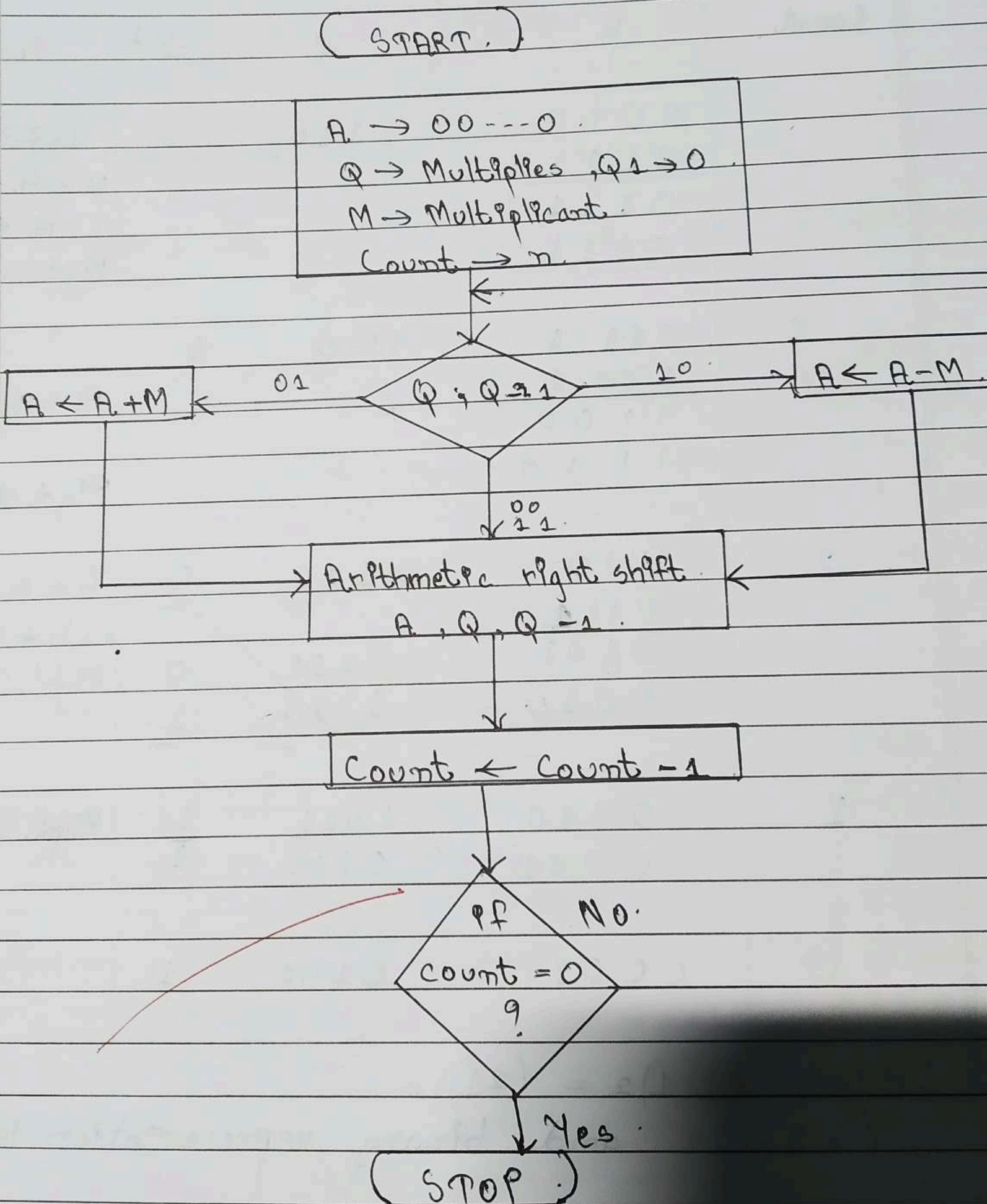
Name of Faculty : Ms. Kshitija Gharat.

Signature : Gharat

Date : 16/8/24

Q. Draw flowchart of Booth's multiplication algorithm and multiply (−7) and (−3) using Booth's algorithm.

→



$(-7) = 1001 = M$, 2' complement of $M = 0111$.
$(-3) = 1101 = Q$.

Count	A	Q	Q_{-1}	Operation
	0000	1101	0	Initial
	+0111			$A \leftarrow A - M$.
	0111.			$\therefore A \leftarrow A$
	0011			Right shift
3	0011.	1110	1.	
	1001			$A \leftarrow A + M$
	1100.			
	1110.			Right shift
2	1110	0111	0	$A \leftarrow A -$
	0111			$\therefore A \leftarrow A +$
	0101	0111.	0	Right shift
	0010.	1011	1.	
1	0010.	1011	1	Right shift
	0001.	0101	1.	
0	0001.	0101	1.	

$\therefore (0001\ 0101)_2 = (21)_{10}$.
$7 \times 3 = 21$ and binary representation is

Q2] Perform Division Restoring Algorithm for Dividend = 13 and Divisor = 5

→ Dividend = 13 = 01101 = Q
Divisor = 5 = 00101 = M
2's complement of M i.e. = 11011

Count n	A	Q	Operation
5	00 000	01101	Initial
	00 000	1101 –	shift left
	+ 11011		A ← A – M
	11011	1101 –	∴ A ← A + 2'(M)
		11010	Q[0] = 0
	0 0000	11010	Restore A
4	0 0000	11010	
	0 0001	1010 –	Shift left
	+ 11011		A ← A – M
	11100	1010 –	∴ A ← A + 2'(M)
		10100	Q[0] = 0
	0 0001	10100	Restore A
3	00001	10100	
	00011	0100 –	Shift left
	+ 11011		A ← A – M
	1 11 10	0100 –	∴ A ← A + 2'(M)
		01000	Q[0] = 0
	0 0011	01 000	Restore A

Count n	A	Q	Operation
		01000	
2	00011	1000-	left shift
	00110		A ← A − M
	+ 11011		∴ A ← A + 2'(M)
	00001	1000-	
	00001	10001	Q[0] = 1
		10001	
1	00001	0001-	left shift
	− 00011		A ← A − M
	+ 111101		
	11110	0001-	∴ A ← A + 2'(M)
		00010	Q[0] = 0
	00011	00010	Restore A
0	00011	00010	Answer

Quotient = $(00010)_2$ — from register 'Q'

= $(2)_{10}$

Remainder = $(00011)_2$ — from register 'A'

= $(3)_{10}$

Represent $(543.21)_{10}$ in single precision format and double precision format.

Step 1 : Convert to binary number

$(543.21)_{10} = ?$

$(543)_{10} = (1000011111)_2$

$0.21 \times 2 = 0.42 = 0.$
$0.42 \times 2 = 0.84 = 0.$
$0.84 \times 2 = 1.68 = 1.$
$0.64 \times 2 = 1.36 = 1.$
$0.36 \times 2 = 0.72 = 0.$
$(0.21)_{10} = (0.00110)_{10}.$

$\therefore (543.21)_{10} = (1000011111.00110)_2.$

Step 2: Normalization

$(543.21)_{10} = 1.\underbrace{000011111 00110}_{N} \times 2^9.$

Step 3: Determine exponent for single precision.

for single precision, compare with
$1.N \times 2^{E-127}$
$\therefore E - 127 = 9.$
$\boxed{E = 136}$

Convert to binary.
$E = (1000\ 1000)_2.$

Single precision ⇛

Sign	Biased exponent	Mantissa (N).
1 bit	3 bit	23 bit

∴ 32 bit = single precision.

0	10001000	0000111100110 - - 0
1 bit	8 bit	23 bit.

Step 4 : Determine exponent for double precision.

for double precision, compare with.

$(1 \cdot N)\ 2^{E-1023}$.

$\therefore E - 1023 = 9$.

$\boxed{E = 1032.}$

Convert to binary. $\therefore E = (10000001000)_2$

Double precision.

Sign	Biased exponent.	Mantissa (N).
1 bit	11 bit	52 bit

∴ 64 bit = double precision.

0	10000001000	000011111 00
1 bit	11 bit	52 bit.