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:	Archita Deepak Gupta
Roll No. :	19
Assignment No.:	02
Title of Assignment:	Apply arithmetic algorithm to solve ALU operation
Date of Submission:	16/8/24
Date of Correction:	16/8/24

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Completeness	5	3
Demonstrated Knowledge	3	3
Legibility	2	2
Total	10	8

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 :

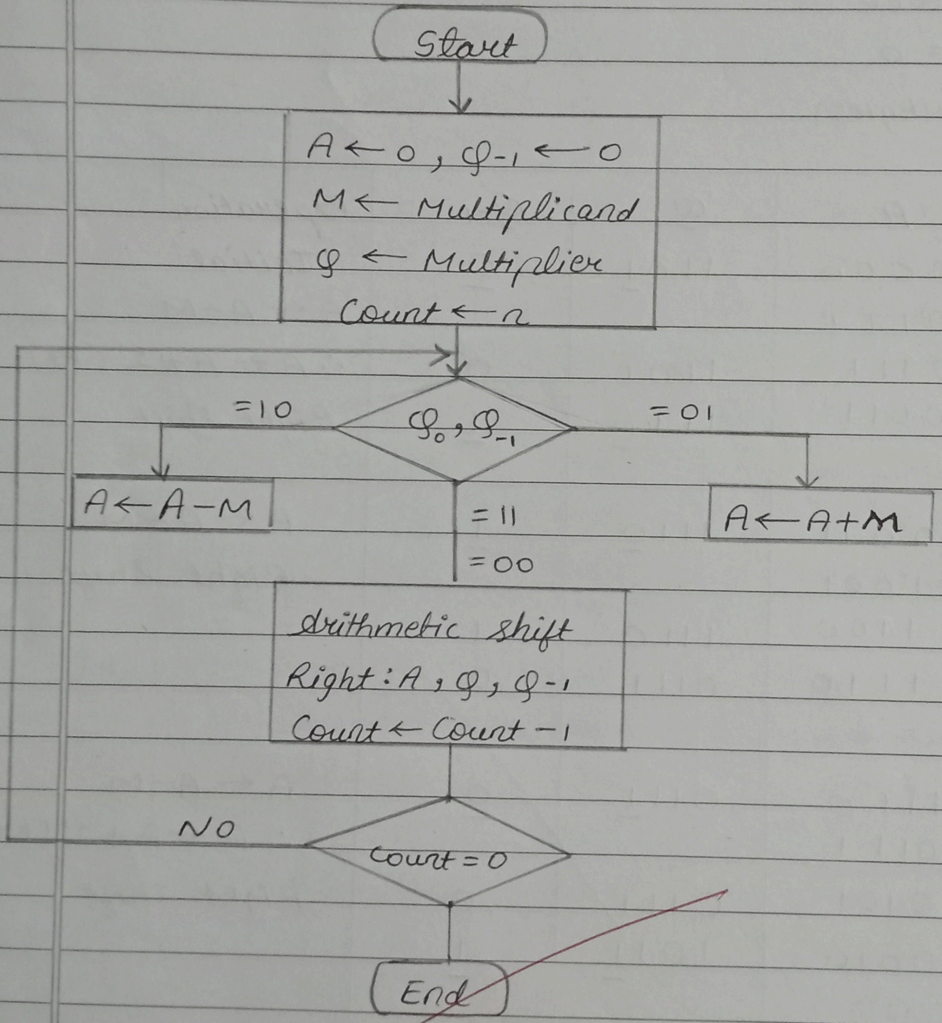
Signature : Bharat

Date : 16/8/24

DATE:

Q1. Draw flowchart of Booth's multiplication algorithm and multiply (-7) and (-3) using Booth's algorithm.

→ Booth's multiplication algorithm flowchart.



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$m = 7 = 0111$
1's complement = 1000
2's complement = 1000 + 1 = 1001

For multiplication of -7 and -3
- m (multiplicand) is -7 = 1001
- Q (multiplier) is -3 = 1101
- A = 0000
- $Q_{-1} = 0$
- n = 4(bytes)

$Q = 3 = 0011$
1's complement = 1100
2's complement = 1100 + 1 = 1101

count	A	Q	Q_{-1}	Operation
	0000	1101	0	Initial
4.	+0111			A ← A−M
	0111	1101	0	∴ A ← A+2'(M)
	0011	1110	1	Right shift
3.	0011	1110	1	A ← A+M
	+1001			Right Shift
	1100	1110	1	
	1110	0111	0	
2.	1110	0111	0	A ← A−M
	+0111			∴ A ← A+2'(M)
	0101	0111	0	Right shift
	0010	1011	1	
1	0010	1011	1	Right shift.
	0001	0101	1	
0	0001	0101	1	

∴ $(0001\ 0101)_2 = (21)_{10}$

7×3 = 21 and binary representation is 10101

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Q2. Perform Division Restoring Algorithm for dividend = 13 and divisor = 5

→ Let dividend which is 13 be Q and divisor which is 5 be M respectively

i.e. Q = 13 , M = 15

count	A	Q	Operation
4	00000	1101	Initialization
	00001	101?	Shift left AQ
	11100	101?	A ← A − M
	00001	1010	Q[0] ← 0, Return A
3	00011	010?	Shift left AQ
	11110	010?	A ← A − M
	00011	0100	Q[0] = 0, Restore A.
2.	00110	100?	Shift left AQ
	00001	100?	A ← A − M
	00001	1001	Q[0] = 1
1.	00011	001?	Shift left AQ
	11110	001?	A ← A − M
	00011	0010	Q[0] = 0, Restore A

∴ Remainder = A = $(00011)_2 = (3)_{10}$

∴ Quotient = Q = $(0010)_2 = (2)_{10}$

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Q3. Represent $(543.21)_{10}$ in Single precision format and double precision format.

→ Given $(543.21)_{10}$

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

$(0.21)_{10} = (0.0011)_2$

$(543.21)_{10} = (1000011111.0011)_2$

$(543.21)_{10} = (1000011111.0011)_2$

$= 1\,1000011111.0011$

$= 1.\underbrace{0000111110011}_{N} \times 2^9$

$N = 0000111110011$

$\therefore$ Single precision format.

$(1.N)2^{E-127}$

$\therefore 1.000011111 \times 2^9$

On comparing both side, we get,

$E - 127 = 9$

$E = 9 + 127 = 136$

$\therefore E = 10001000$

$\therefore$ Single precision format $N = 0000111110011$

0	10001000	0000111110011 00
bit	8 bit	23 bit

For double precision,

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

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$\therefore (1.0000111110011) \times 2^9$

On comparing we get,

$E - 1023 = 9$

$E = 9 + 1023 = 1032$

$\therefore E = 10000001000$

$\therefore N = 0000111110011$

0	10000001000	0000111110011 ···· 00
1 bit	11 bit	52 bit