

COA

Q1. Divide $(7)_{10}$ by $(4)_{10}$ using Restoring & Non-Restoring method of binary division.

→ Restoring Method

$N=4, A=0, M=0100, Q=0111, -M=1100$

N	M	A	Q	Operation
4	00100	00000	0111	Initialization
		00000	111-	SLAQ
		11100	111-	$A=A-M$
		00000	1110	$Q[0] \rightarrow 0$, Restore A
3	00100	00001	110-	SLAQ
		11101	110-	$A=A-M$
		00001	1100	$Q[0] \rightarrow 0$, Restore A
2	00100	00011	100-	SLAQ
		11111	100-	$A=A-M$
		00011	1000	$Q[0] \rightarrow 0$, Restore A
1	00100	00111	000-	SLAQ
		00011	000-	$A=A+M$
		00011	0001	$Q[0] \rightarrow 1$

$n=0$ Halt

Quotient = $00010 = 3_{10}$

Remainder = $0001 = 1_{10}$

Non-Restoring Method

$N = 4$, $A = 0$, $M = 0100$, $Q = 0111$, $-M = 11100$

N	M	A	Q	Operation
4	00100	00000	0111	Initialization
		00000	111-	SLAQ
		11100	111-	$A = A - M$
		11100	1110	$Q[0] \rightarrow 0, A[n] = 1$
3	00100	11001	110-	SLAQ
		11001	110-	$A = A + M$
		11001	1100	$A[n] = 1, Q[0] = 0$
2	00100	11011	100-	SLAQ
		11111	100-	$A = A + M$
		11111	1000	$A[n] = 1, Q[0] = 0$
1	00100	11111	000-	SLAQ
		00011	000-	$A = A + M$
		00011	0001	$A[n] = 0, Q[0] = 1$

$n = 0$ Halt

Quotient = $001 = 3_{10}$

Remainder = $0001 = 1_{10}$

Q2. Multiply $(14)_{10}$ by $(5)_{10}$ using Booth's algorithm

→ $M = 01110$; $Q = 00101$; $A = 0$; $q_0 = 0$; $N = 5$; $-M = 10010$

N	A	Q	q_0	Operation
5	00000	00101	0	Initialization
	10010	00101	0	$A = A - M$
4	11001	00010	1	Shift Right AQq_0
	00111	00010	1	$A = A + M$
3	00011	10001	0	Shift Right AQq_0
	10101	10001	0	$A = A - M$
2	11010	11000	1	Shift Right AQq_0
	01000	11000	1	$A = A + M$
1	00100	01100	0	Shift Right AQq_0
0	00010	00110	0	Shift Right AQq_0

Final Product = $\{00010\ 00110\}_2$
 $= 70_{10}$