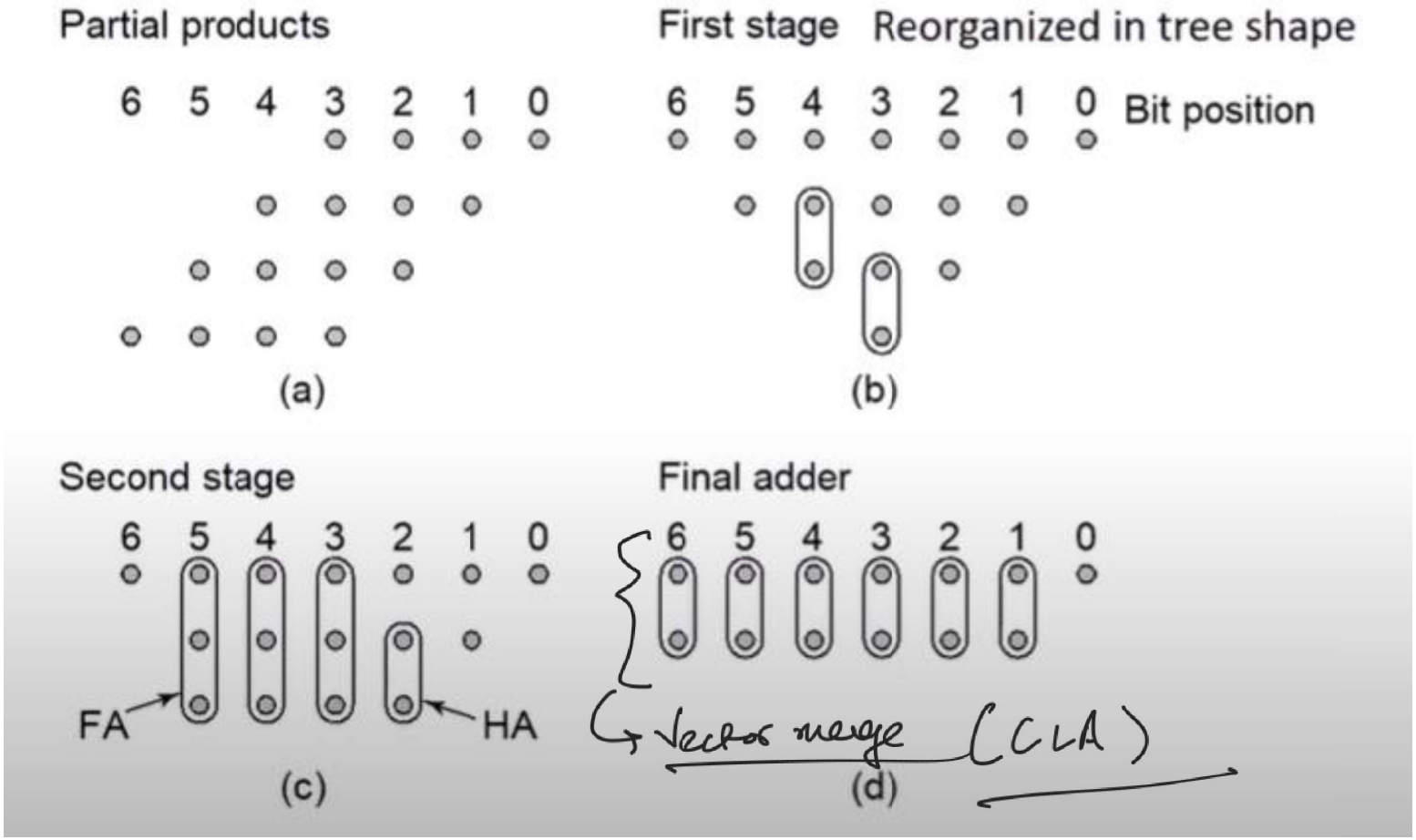
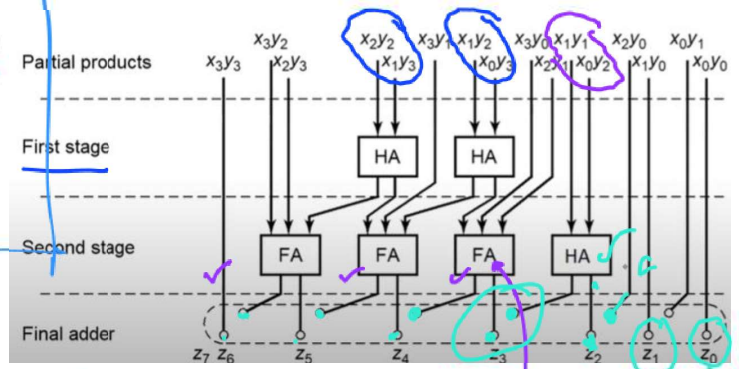
Wallace Tree Multiplier





Sum of subscripts is a way to check

$x_3 x_2 x_1 x_0$

$y_3 y_2 y_1 y_0$

x_3y_0 x_2y_0 x_1y_0 x_0y_0

x_3y_1 x_2y_1 x_1y_1 x_0y_1

x_3y_2 x_2y_2 x_1y_2 x_0y_2

x_3y_3 x_2y_3 x_1y_3 x_0y_3

PP_0

PP_1

PP_2

PP_3

CLA

6τ

5τ

11τ

1011

0111

n-bit addition

$n = 4$

$2\left\lceil \frac{n}{4} \right\rceil + 2$

$2\left\lceil \frac{2n}{4} \right\rceil + 2$

$2 + \frac{8}{4} \rightarrow 4$

$= 6\tau$

x_3y_3 x_3y_2 x_3y_1 x_3y_0 x_1y_0 x_0y_0

x_2y_3 x_2y_2 x_2y_1 x_1y_1 x_0y_1

x_1y_3 x_0y_2 x_1y_2

x_0y_3

CLA

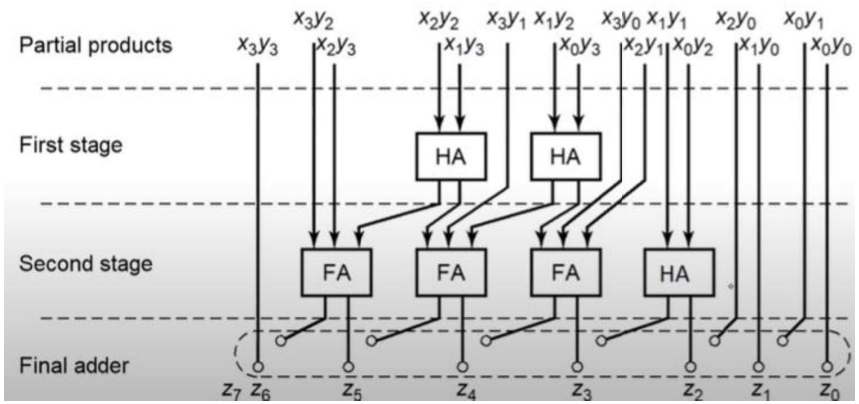
S

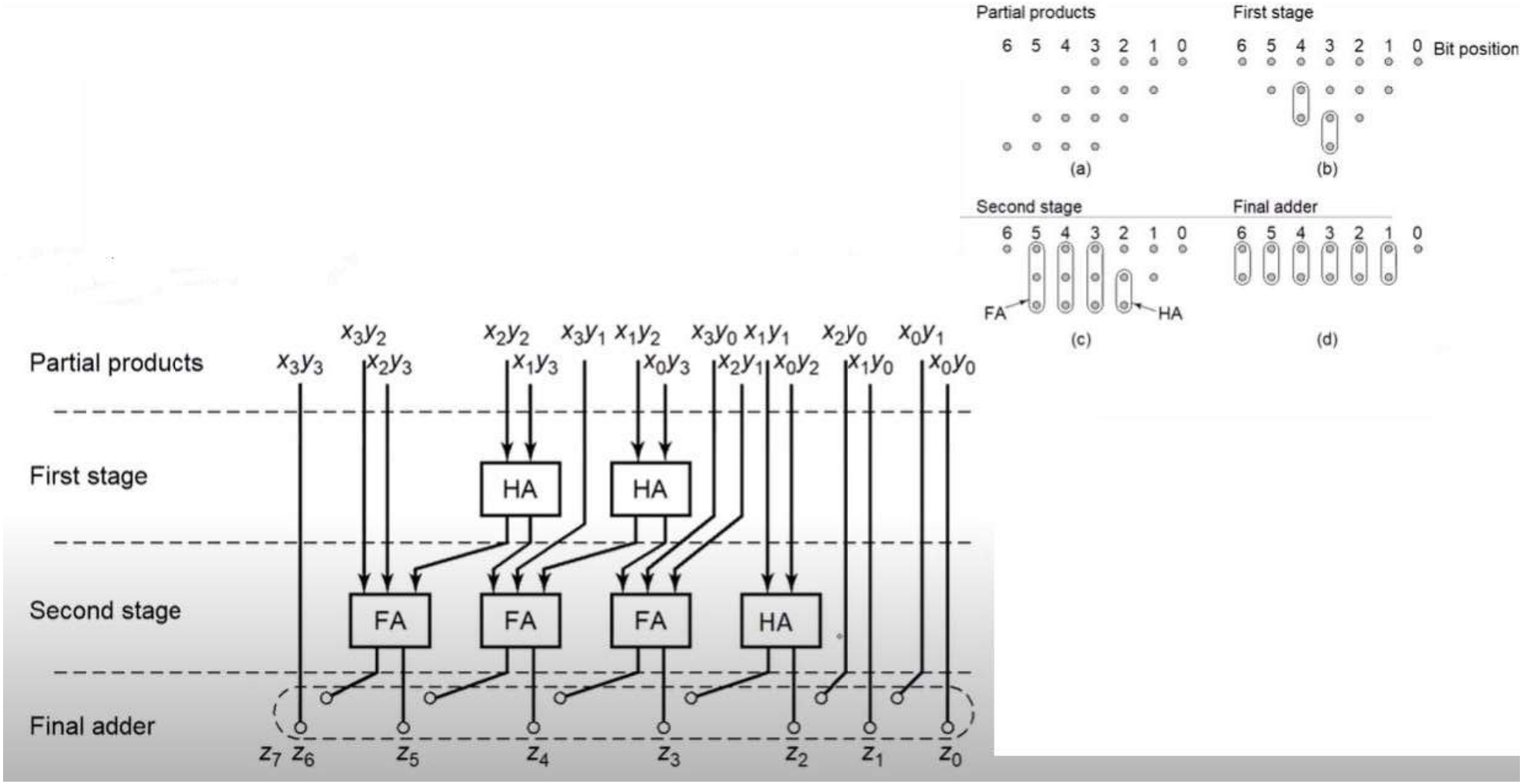
Z_0

S

(TO BE COMPLETED)

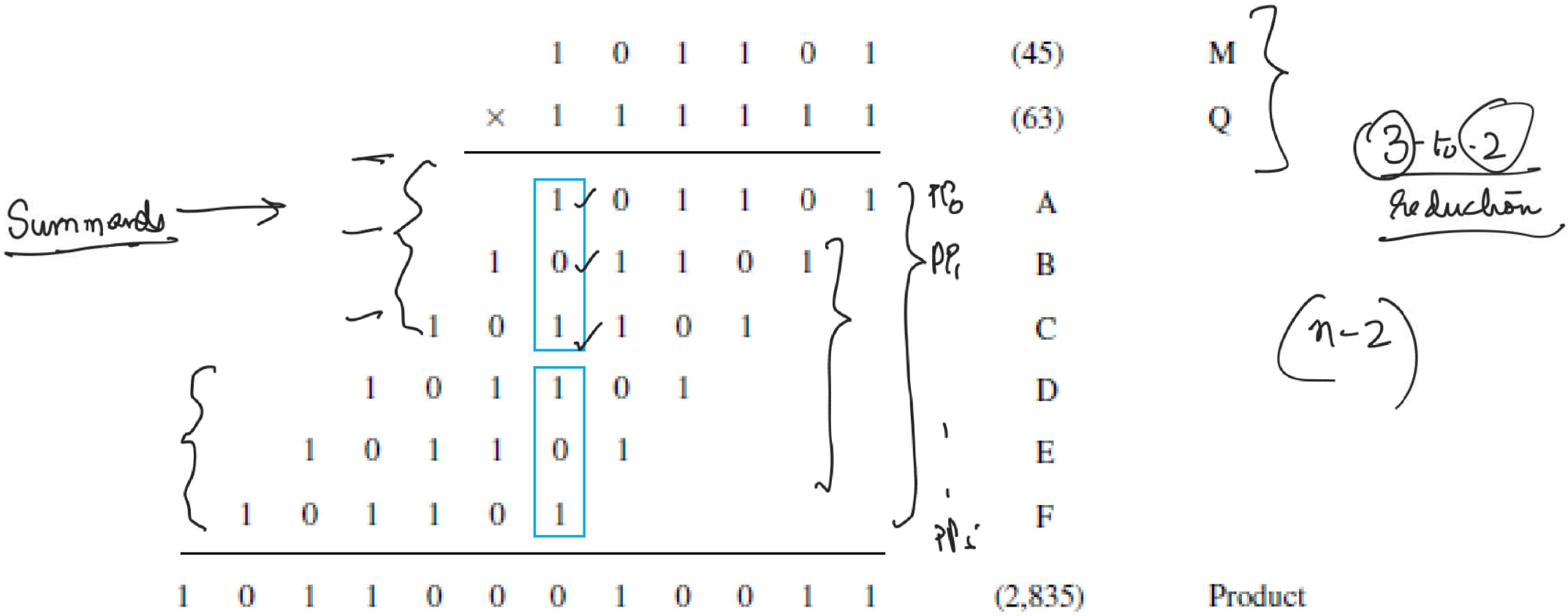
[Figs: To be acknowledged (Textbook ↗).]




Partial products
First stage
Second stage
Final adder
x_3y_3 x_3y_2 x_2y_3 x_2y_2 x_1y_3 x_3y_1 x_1y_2 x_0y_3 x_3y_0 x_2y_1 x_1y_1 x_0y_2 x_2y_0 x_1y_0 x_0y_1 x_0y_0
HA
HA
FA
FA
FA
HA
z_7 z_6 z_5 z_4 z_3 z_2 z_1 z_0
Partial products
First stage
Second stage
Final adder
6 5 4 3 2 1 0
Bit position
(a)
(b)
(c)
(d)
FA
HA

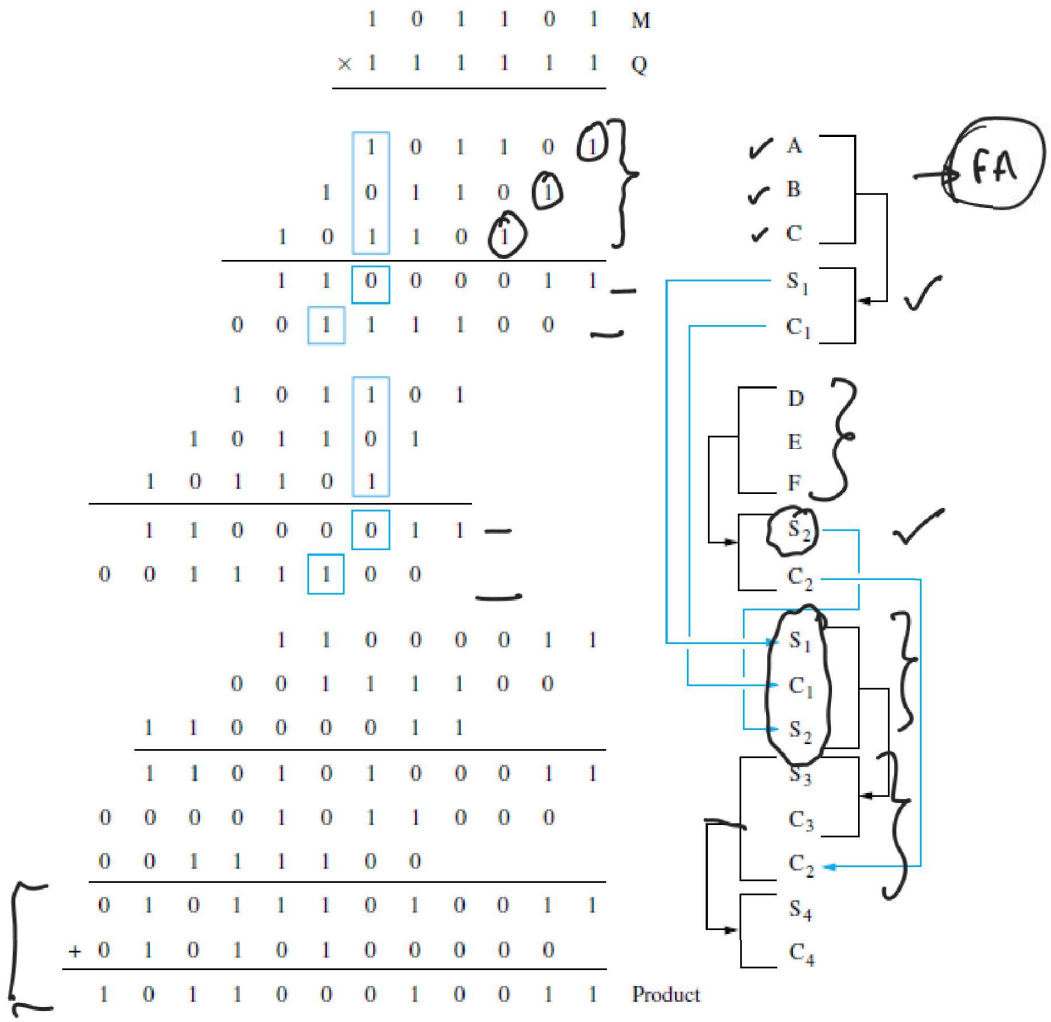
Summand Addition Tree using 3-2 Reducers

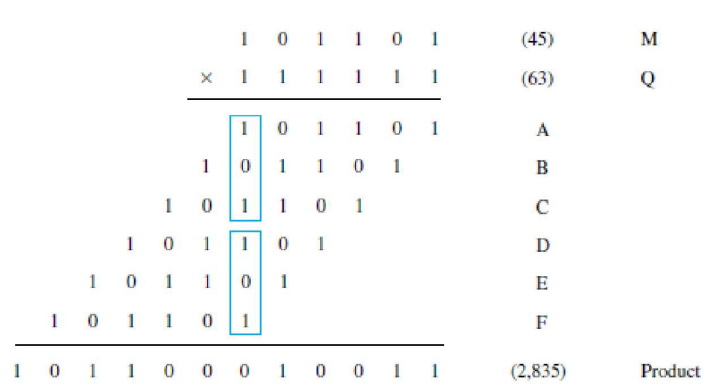
Hamacher

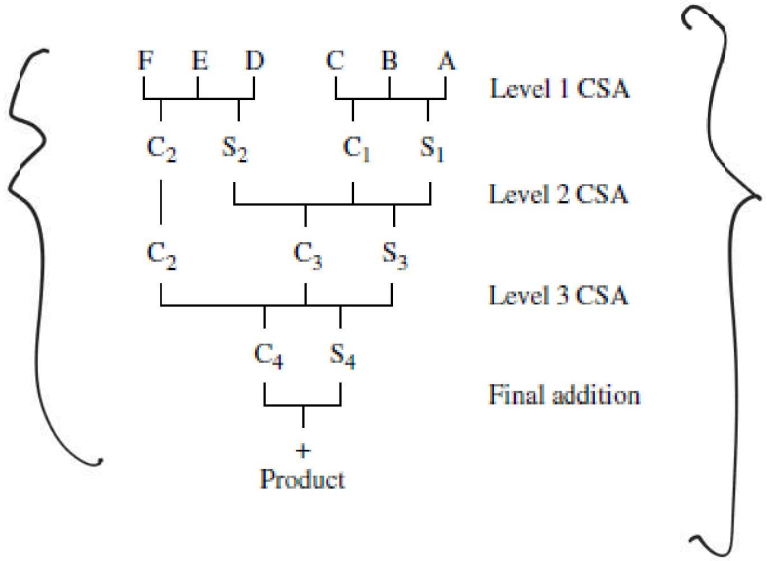


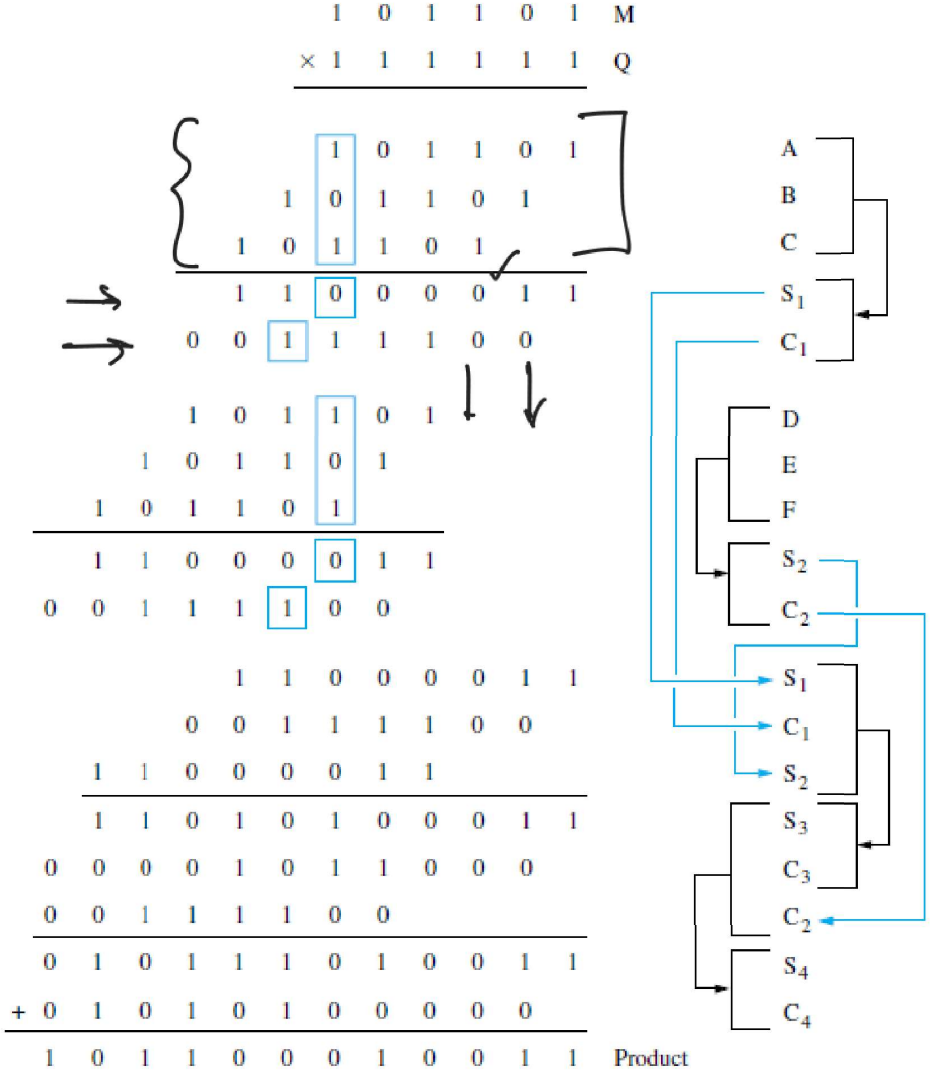
Summand Addition Tree using 3-2 Reducers.

					1	0	1	1	0	1	(45)	M
				×	1	1	1	1	1	1	(63)	Q
					1	0	1	1	0	1		A
				1	0	1	1	0	1			B
			1	0	1	1	0	1				C
		1	0	1	1	0	1					D
	1	0	1	1	0	1						E
1	0	1	1	0	1							F
1	0	1	1	0	0	0	1	0	0	1	1	(2,835)	Product




1 0 1 1 0 1 (45) M
× 1 1 1 1 1 1 (63) Q
1 0 1 1 0 1 A
1 0 1 1 0 1 B
1 0 1 1 0 1 C
1 0 1 1 0 1 D
1 0 1 1 0 1 E
1 0 1 1 0 1 F
1 0 1 1 0 0 0 1 0 0 1 1 (2,835) Product


F E D C B A
Level 1 CSA
C2 S2 C1 S1
Level 2 CSA
C2 C3 S3
Level 3 CSA
C4 S4
Final addition
+
Product


1 0 1 1 0 1 M
× 1 1 1 1 1 1 Q
A
B
C
S1
C1
D
E
F
S2
C2
S1
C1
S2
S3
C3
C2
S4
C4
1 0 1 1 0 0 0 1 0 0 1 1 Product