

1)

| $\theta \backslash A$ | 0 | 1 |
|-----------------------|---|---|
| 0                     | 0 | 1 |
| 1                     | 1 | 0 |

SOP  $F = A'\theta + \theta'A$

POS  $F' = A\theta' + A\theta$

$(F')' = (A\theta' + A\theta)'$

$F = (A+\theta)(A'+\theta')$

2)

| A | B | C <sub>in</sub> | Sum | Cont |
|---|---|-----------------|-----|------|
| 0 | 0 | 0               | 0   | 0    |
| 0 | 0 | 1               | 1   | 0    |
| 0 | 1 | 0               | 1   | 0    |
| 0 | 1 | 1               | 0   | 1    |
| 1 | 0 | 0               | 1   | 0    |
| 1 | 0 | 1               | 0   | 1    |
| 1 | 1 | 0               | 0   | 1    |
| 1 | 1 | 1               | 1   | 1    |

| $\theta \backslash A$ | 0 | 0 | 1 | 1 | 1 |
|-----------------------|---|---|---|---|---|
| C <sub>in</sub>       | 0 | 0 | 0 | 1 | 1 |
| 0                     | 0 | 0 | 1 | 0 | 1 |
| 1                     | 1 | 0 | 1 | 1 | 0 |

| $\theta \backslash A$ | 0 | 0 | 0 | 1 | 1 | 1 |
|-----------------------|---|---|---|---|---|---|
| C <sub>in</sub>       | 0 | 0 | 0 | 1 | 1 | 1 |
| 0                     | 0 | 0 | 0 | 1 | 0 | 0 |
| 1                     | 0 | 0 | 1 | 1 | 1 | 1 |

SOP  $F = A'\theta'C_{in} + A\theta'C_{in} + A'\theta'C_{in} + A\theta'C_{in}$

$F' = A\theta'C_{in} + A\theta'C_{in} + A'\theta'C_{in} + A\theta'C_{in}$

POS  $(F')' = F = (A+\theta+C_{in})(A'+\theta'+C_{in})(A'+\theta'+C_{in})(A'+\theta'+C_{in})$

SOP  $F = A\theta'C_{in} + A'\theta'C_{in} + A\theta'C_{in} + A\theta'C_{in}$

$F = A\theta + A'\theta'C_{in} + A\theta'C_{in}$

POS  $F' = A\theta'C_{in} + A'\theta'C_{in} + A\theta'C_{in} + A'\theta'C_{in}$

$(F')' = F = (A+\theta)(A+\theta'+C_{in})(A'+\theta+C_{in})$

3)

| N <sub>1</sub> | N <sub>2</sub> | Z <sub>1</sub> | Z <sub>2</sub> | Z <sub>3</sub> |
|----------------|----------------|----------------|----------------|----------------|
| 0              | 0              | 0              | 0              | 0              |
| 0              | 0              | 0              | 1              | 0              |
| 0              | 0              | 1              | 0              | 0              |
| 0              | 0              | 1              | 1              | 0              |
| 0              | 1              | 0              | 0              | 0              |
| 0              | 1              | 0              | 1              | 0              |
| 0              | 1              | 1              | 0              | 0              |
| 0              | 1              | 1              | 1              | 0              |
| 1              | 0              | 0              | 0              | 0              |
| 1              | 0              | 0              | 1              | 0              |
| 1              | 0              | 1              | 0              | 0              |
| 1              | 0              | 1              | 1              | 0              |
| 1              | 1              | 0              | 0              | 0              |
| 1              | 1              | 0              | 1              | 0              |
| 1              | 1              | 1              | 0              | 0              |
| 1              | 1              | 1              | 1              | 0              |

| $\theta \backslash A$ | 0 | 0 | 0 | 1 | 1 |
|-----------------------|---|---|---|---|---|
| C <sub>in</sub>       | 0 | 0 | 0 | 1 | 1 |
| 0                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |

| $\theta \backslash A$ | 0 | 0 | 0 | 1 | 1 |
|-----------------------|---|---|---|---|---|
| C <sub>in</sub>       | 0 | 0 | 0 | 1 | 1 |
| 0                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |

| $\theta \backslash A$ | 0 | 0 | 0 | 1 | 1 |
|-----------------------|---|---|---|---|---|
| C <sub>in</sub>       | 0 | 0 | 0 | 1 | 1 |
| 0                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |
| 1                     | 0 | 0 | 0 | 1 | 1 |

SOP:  $F = A'\theta'C'D' + AC' + A\theta'CD'$

POS:  $F' = A\theta' + (A\theta' + A\theta')C + A'\theta'CD' + A\theta'CD'$

$F' = A\theta' + A\theta'C + A\theta'C' + A\theta'CD' + A\theta'CD'$

$(F')' = F = (A+\theta)(A+\theta'+C')(A'+\theta+C')(A+\theta'+C'+D')$

SOP

$F = A'C + A'\theta'C'D' + A\theta'CD'$

POS

$F' = C'D' + (C'D' + C'D')A + A'\theta'C'D' + A\theta'CD'$

$F' = C'D' + AC'D' + AC'D' + A'\theta'C'D' + A\theta'CD'$

$(F')' = F = (C+D)(A'+C+D')(A'+C+D)(A+\theta'+C+D')(A'+\theta'+C'+D')$

SOP

$F = A'\theta'C'D' + A'\theta'C'D' + A'\theta'C'D' + A\theta'CD'$

POS

$F' = A'C + AC' + A'\theta'C'D' + A\theta'CD' + A\theta'CD' + A'\theta'C'D'$

$(F')' = F = (A+C')(A'+C)(A+\theta'+C+D)(A+\theta'+C'+D')$

$(A+\theta'+C+D)(A+\theta'+C'+D')$

4)

| S | $x_0$ | $x_1$ | Z |
|---|-------|-------|---|
| 0 | 0     | 0     | 0 |
| 0 | 0     | 1     | 0 |
| 0 | 1     | 0     | 1 |
| 0 | 1     | 1     | 1 |
| 1 | 0     | 0     | 0 |
| 1 | 0     | 1     | 1 |
| 1 | 1     | 0     | 0 |
| 1 | 1     | 1     | 1 |

| $S \backslash x_0 x_1$ | 00 | 01 | 11 | 10 |
|------------------------|----|----|----|----|
| 0                      | 0  | 0  | 1  | 1  |
| 1                      | 0  | 1  | 1  | 0  |

SOP  $F = S'x_0 + Sx_1$

POS  $F' = S'x_0' + Sx_1'$

$(F')' = F = (x_0 + x_1)(x_0 + x_1' + S)(x_0' + x_1 + S')$

5)

| $S, S_0 \backslash x_0 x_1 x_2$ | 000 | 001 | 011 | 010 | 110 | 111 | 101 | 100 |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| 000                             | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   |
| 001                             | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   |
| 011                             | 0   | 0   | 1   | 1   | 1   | 1   | 0   | 0   |
| 010                             | 0   | 0   | 1   | 1   | 1   | 1   | 0   | 0   |
| 110                             | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 111                             | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| 101                             | 0   | 1   | 1   | 0   | 0   | 1   | 1   | 0   |
| 100                             | 0   | 1   | 1   | 0   | 0   | 1   | 1   | 0   |

$F = S_1 S_0' x_0 + S_1' S_0 x_1 + S_1 S_0' x_2 + S_1 S_0 x_3$