

$$\text{alu_op}[4] = 0$$

$$\begin{aligned} \text{alu_op}[3] &= I_{31}' I_{30}' I_{29}' I_{28}' I_{27}' I_{26}' I_5 I_4' I_3' I_2' I_1' I_0' \\ &\quad + I_{31}' I_{30}' I_{29}' I_{28}' I_{27}' I_{26}' I_5 I_4' I_3' I_2' I_1' I_0' \\ &\quad + I_{31}' I_{30}' I_{29}' I_{28}' I_{27}' I_{26}' \end{aligned}$$

$$= I_{31}' I_{30}' I_{29}' I_{27}' I_{26}' (I_{28}' I_5 I_4' I_3' I_2' I_1' I_0' + I_{28}' I_5 I_4' I_3' I_2' I_1' I_0' + I_{28})$$

$$= I_{31}' I_{30}' I_{29}' I_{27}' I_{26}' (I_{28} + I_5 I_4' I_2' I_0' [I_3' I_1 + I_3 I_1])$$

$$= I_{31}' I_{30}' I_{29}' I_{27}' I_{26}' (I_{28} + I_5 I_4' I_2' I_0' (I_1 (I_3' I_3)))$$

$$= (I_{31} + I_{30} + I_{29} + I_{27} + I_{26})' (I_{28} + I_5 (I_4 + I_2 + I_0) I_1)$$

$$\text{alu_op}[2] = \text{alu_op}[3]$$

$$\begin{aligned} \text{alu_op}[0] &= I_{31}' I_{30}' I_{29}' I_{28}' I_{27}' I_{26}' I_5 I_4' I_3' I_2' I_1' I_0' \\ &\quad + I_{31}' I_{30}' I_{29}' I_{28}' I_{27}' I_{26}' I_5 I_4' I_3' I_2' I_1' I_0' \end{aligned}$$

$$= I_{31}' I_{30}' I_{29}' I_{28}' I_{27}' I_{26}' I_5 I_4' (I_3' I_2' I_1' I_0' + I_3 I_2' I_1' I_0')$$

$$= (I_{31} + I_{30} + I_{29} + I_{28} + I_{27} + I_{26} + I_4)' I_5 (I_3' I_2' I_1' I_0' + I_3 I_2' I_1' I_0')$$

$$\begin{aligned}
 \text{alu.op}[i] = & I_{31} I_{30}' I_{29}' I_{28}' I_{27} I_{26} + \\
 & I_{31} I_{30}' I_{29} I_{28}' I_{27} I_{26} + \\
 & I_{31}' I_{30}' I_{29} I_{28}' I_{27} I_{26} + \\
 & I_{31}' I_{30} I_{29}' I_{28} I_{27}' I_{26}' I_5 I_4' I_3' I_2' I_1' I_0' + \\
 & I_{31}' I_{30}' I_{29}' I_{28} I_{27}' I_{26}' I_5 I_4 I_3' I_2' I_1' I_0' + \\
 & I_{31}' I_{30}' I_{29} I_{28}' I_{27} I_{26}' I_5 I_4' I_3 I_2' I_1' I_0' + \\
 & I_{31}' I_{30} I_{29}' I_{28} I_{27}' I_{26}' I_5 I_4 I_3 I_2' I_1' I_0' + \\
 & I_{31}' I_{30}' I_{29}' I_{28} I_{27} I_{26}'
 \end{aligned}$$

$$\begin{aligned}
 = & I_{30}' (I_{31} I_{28}' I_{27} I_{26} (I_{29}' + I_{29}) + \\
 & I_{31}' I_{27}' I_{26}' (I_{29} I_{28} + I_{29} I_{28} + \\
 & I_{29} I_{28} I_5 I_4' I_2' I_0' \\
 & (I_3' I_1 + I_3 I_1 + I_3 I_1))
 \end{aligned}$$

$$\begin{aligned}
 = & I_{30}' (I_{31} I_{28}' I_{27} I_{26} + I_{31}' I_{27}' I_{26}' (I_{29} \oplus I_{28}) + \\
 & I_{29} I_{28} I_5 I_4 I_2 I_0 (I_3 I_1 + I_3 I_1 + I_3 I_1 + I_3 I_1))
 \end{aligned}$$

$$\begin{aligned}
 = & I_{30}' (I_{31} I_{28}' I_{27} I_{26} + I_{31}' I_{27}' I_{26}' (I_{29} \oplus I_{28}) + \\
 & I_{29} I_{28} I_5 I_4 I_2 I_0 (I_3' (I_1' + I_1) + I_1 (I_3' + I_3)))
 \end{aligned}$$

$$\begin{aligned}
 = & I_{30}' (I_{31} I_{28}' I_{27} I_{26} + (I_{31}' + I_{27}' + I_{26}')' [(I_{29} \oplus I_{28}) + \\
 & I_5 (I_{29} + I_{28} + I_4 + I_2 + I_0)' (I_3' + I_1)]
 \end{aligned}$$