

1. Write in SOP form:

$$(B' + C' + D')(A' + B' + C')(A + B + C)(B + C + D)$$

$$\begin{aligned} \text{let } X &= B' + C' \\ Y &= D' \quad Z = A' \\ \text{use Theorem 8D} \end{aligned}$$

$$\begin{aligned} \text{let } X &= B + C \\ Y &= A \quad Z = D \\ \text{use Theorem 8D} \end{aligned}$$

$$= (B' + C' + A'D') (B + C + AD)$$

multiply out

$$\begin{aligned} = & B'B + B'C + B'AD + C'B + C'C + C'AD \\ & + A'D'B + A'D'C + A'D'AD \end{aligned}$$

Eliminate 0's via theorem 5D

$$\begin{aligned} = & B'C + B'AD + C'B + C'AD + A'D'B + A'D'C \\ & \text{(good enough)} \end{aligned}$$

more simplification possible:

$$\begin{array}{l} B'AD \text{ and } C'B \xrightarrow{\text{consensus}} AC'D \\ A'D'B \text{ and } B'C \xrightarrow{\text{consensus}} A'CD' \end{array}$$

$$= B'C + B'AD + C'B + A'D'B$$

2. Factor

$$ACD + A'B'D + A'BC + AC'D'$$

$$= A(CD + C'D') + A'(B'D + BC) \quad (\text{theorem 8})$$

$$= (A + B'D + BC)(A' + CD + C'D') \quad (\text{theorem 16D})$$

$$= (A + B'D + B)(A + B'D + C)(A' + CD + C')(A + CD + D') \quad (\text{theorem 8D})$$

$$= (A + B + B')(A + B + D)(A + C + B')(A + C + D) \\ (A' + C' + C)(A' + C' + D)(A + D' + C)(A + D' + D)$$

$$= (1) (A + B + D)(A + C + B') (A + C + D) \\ (1) (A' + C' + D)(A + D' + C) (1)$$

$$= (A + B + D)(A + C + B')(A + C + D)(A' + C' + D)(A + D' + C)$$