

$$\bigwedge_{i=1}^4 \left(\bigvee_{j=1}^3 P_{i,j} \right) \wedge \bigwedge_{j=1}^3 \bigwedge_{i=1}^3 \bigwedge_{i'=i+1}^4 (\neg P_{i,j} \vee \neg P_{i',j})$$