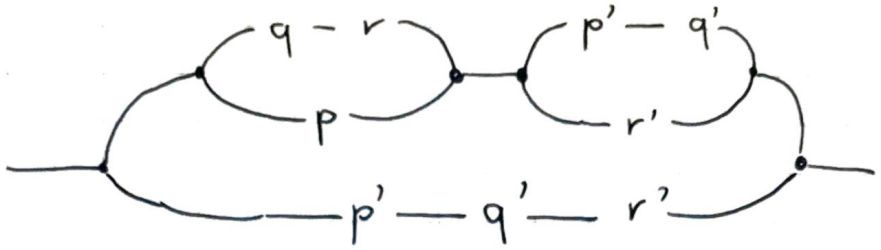
1.




a)b) $(qr + p)(p'q' + r') + p'q'r'$

$= qrp'q' + qrr' + pp'q' + pr' + p'q'r'$

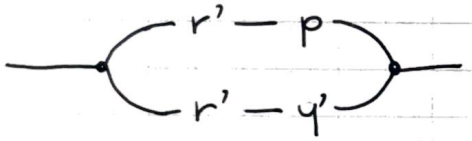
$= pr' + p'q'r'$

$= r'(p + p'q')$

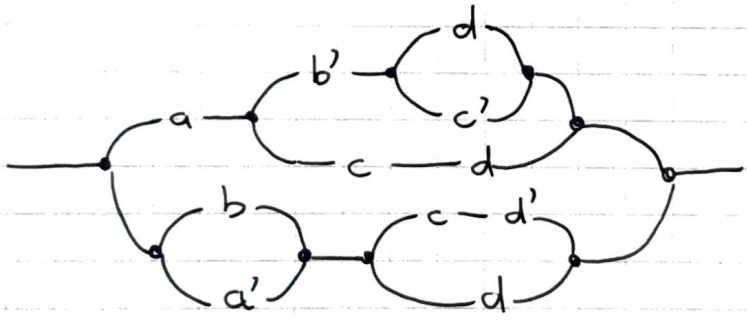
$= r'(p + q')$

$= r'p + r'q'$

c)




2.




a) ~~d~~ $((d + c')b' + cd)a + (b + a')(cd' + d)$

$= (b'd + b'c' + cd)a + (b + a')(c + d)$

$= ab'd + ab'c' + acd + bc + bd + a'c + a'd$

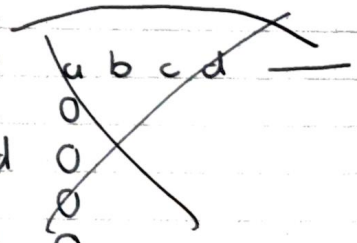
$= d(ab' + b) + ab'c' + acd + bc + a'c + a'd$

$= da + db + ab'c' + acd + bc + a'c + a'd$

$= da + db + ab'c' + bc + a'c + a'd$

$= d + db + ab'c' + bc + a'c$

$= d + bc + ca' + ab'c'$



b)

| a | b | c | d | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

3 a)

$\Rightarrow$ ~~(a+b+c+d)~~ ( POS:

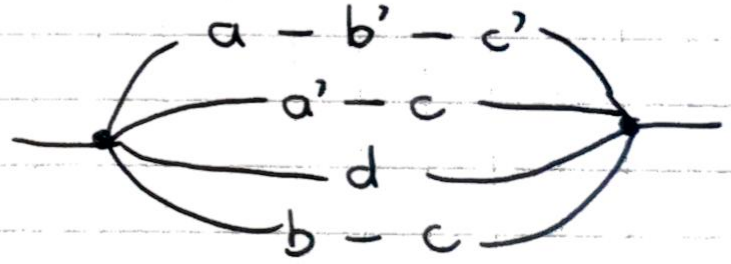
$(a+b+c+d)(a+b'+c+d)(a'+b+c'+d)(a'+b'+c+d)$

b)

| AB \ CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 1 | 1 |
| 01 | 0 | 1 | 1 | 1 |
| 11 | 0 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 0 |

SOP: $AB'C' + A'C + D + BC$

c)



4a)

| C \ AB | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |

SOP:
$A'B' + AC' + AB'$
$= B' + AC'$

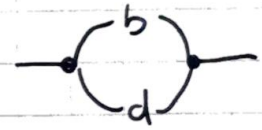
b) POS: $(A' + B')(B' + C')$

c) If the combination ABC is not realistic & the truth table only has ABC, SOP & POS would be 0, since there are nothing else to consider.

5.

| CD \ AB | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 1 | 0 |
| 01 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 |
| 10 | 0 | 1 | 1 | 0 |

a) SOP: $B + D$

b) 


6

| c | p | v | O1 | O2 | L |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 |

$(pc' + cv')(pv' + vc')$
$= pc'pv' + pc'vc' + cv'pv' + cv'vc'$
$= pc'v' + pvc' + cpv' + 0$
$= pc' + cpv'$
$= pc' + pv'$
$= p(c' + v')$