By Michael Little

Truth table:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D |  | a | b | c | d | e | f | g |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 4 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 5 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 6 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 7 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 9 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | A | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 | b | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | C | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | d | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | E | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | F | 1 | 0 | 0 | 0 | 1 | 1 | 1 |

kmap for a:

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

a = ~Ac + BC +A~D + ~B~D + ~ABD+A~B~C

kmab for b

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

b = ~B~C + ~B~D + ~A~C~D + ~ACD + A~CD

kmab for c

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

c = ~AB + A~B + ~CD + ~A~C + ~AD

kmab for d

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

d = B~CD + ~BCD + BC~D + A~C~D + ~A~B~D

kmab for e

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

e = AB + C~D + AC + A~D + ~B~D

kmab for f

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

f = A~B + ~C~D + B~D + AC + ~AB~C

kmab for g

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

g = A~B + C~D + AD +~BC + ~AB~C