Digdarshan Kunwar

CS 2018 Problem Sheet #7

Problem 7.1:

A Boolean function is defined using the following sum of minterms:

a) Calculate the prime implicants of ϕ.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Minterm | Pattern | Used | Minterm | Pattern | Used | Minterm | Pattern | Used |
|  | 00000 | ✓ |  | 000-0  00-00  -0000 | ✓  ✓ |  | 00--0 |  |
|  | 00010  00100  10000 | ✓  ✓  ✓ |  | 00-10  0-010  001-0  1000- | ✓  ✓  ✓ |  | 0--10 |  |
|  | 00110  01001  01010  10001 | ✓  ✓  ✓  ✓ |  | 0-110  01-01  -1010  01-10  10-01 | ✓  ✓  ✓ |  | -1-10 |  |
|  | 01101  01110  10101  11010  11100 | ✓  ✓  ✓  ✓  ✓ |  | 011-1  0111-  -1110  11-10  111-0 | ✓  ✓  ✓ |  | -111- |  |
|  | 01111  11110 | ✓  ✓ |  | -1111  1111- | ✓  ✓ |  |  |  |
|  | 11111 | ✓ |  |  |  |

­

This gives us the prime implicants :

= ()

= ()

= ()

= ()

= ()

= ()

= ()

= ()

= ()

= ()

b) Construct the prime implicant chart and identify the essential prime implicants.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ✓ | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ✓ |  |  |  |  |  |  |  |  | ✓ |  |  |  |  |  |  |
|  |  | ✓ |  | ✓ |  | ✓ |  | ✓ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | ✓ | ✓ |  |  |  |  |  |
|  |  |  |  |  | ✓ |  | ✓ |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | ✓ |  | ✓ |  |  |  |  | ✓ |  | ✓ |  |
|  |  |  |  |  |  |  |  |  |  |  | ✓ | ✓ |  |  |  |  |
|  |  |  |  |  |  |  | ✓ |  | ✓ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | ✓ | ✓ |  |  |  |  |  | ✓ | ✓ |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | ✓ | ✓ |  |

Essential prime implicants:

= ()

= ()

= ()

= ()

= ()

= ()

= ()

c) Write out the minimal boolean expressions defining.

(