|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | a | b | c | d | F |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 2 | 0 | 0 | 1 | 0 | 0 |
| 3 | 0 | 0 | 1 | 1 | 0 |
| 4 | 0 | 1 | 0 | 0 | 1 |
| 5 | 0 | 1 | 0 | 1 | X |
| 6 | 0 | 1 | 1 | 0 | 1 |
| 7 | 0 | 1 | 1 | 1 | 1 |
| 8 | 1 | 0 | 0 | 0 | 1 |
| 9 | 1 | 0 | 0 | 1 | 1 |
| 10 | 1 | 0 | 1 | 0 | X |
| 11 | 1 | 0 | 1 | 1 | 0 |
| 12 | 1 | 1 | 0 | 0 | 1 |
| 13 | 1 | 1 | 0 | 1 | 1 |
| 14 | 1 | 1 | 1 | 0 | 1 |
| 15 | 1 | 1 | 1 | 1 | 0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ab  cd | 00 | 01 | 11 | 10 |
| 00 | 0 | 1 | 1 | 1 |
| 01 | 1 | x | 1 | 1 |
| 11 | 0 | 1 | 0 | 0 |
| 10 | 0 | 1 | 1 | x |

**1.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E | F |
| Pr. Imp. | a’b | c’d | ac’ | ad’ | bc’ | bd’ |
| Cov. Po. | 4,5,6,7 | 1,5,9,13 | 8,9,12,13 | 8,10,12,14 | 4,5,12,13 | 4,6,12,14 |
| Cost | 5 | 5 | 5 | 5 | 5 | 5 |

**2.**  Since 5 and 10 are not required, they will be ignored in the chart

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 4 | 6 | 7 | 8 | 9 | 12 | 13 | 14 | Cost |
| A |  | x | x | x |  |  |  |  |  | 5 |
| B | x |  |  |  |  | x |  | x |  | 5 |
| C |  |  |  |  | x | x | x | x |  | 5 |
| D |  |  |  |  | x |  | x |  | x | 5 |
| E |  | x |  |  |  |  | x | x |  | 5 |
| F |  | x | x |  |  |  | x |  | x | 5 |

1 and 7 are distinguished points, therefore A and B are essential prime implicants, so that they are removed from the chart and distinguished points are marked.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 4 | 6 | 8 | 9 | 12 | 13 | 14 | Cost |
| C |  |  | x | x | x | x |  | 5 |
| D |  |  | x |  | x |  | x | 5 |
| E | x |  |  |  | x | x |  | 5 |
| F | x | x |  |  | x |  | x | 5 |

A and B covers 1,4,6,7,9,13. Remaining true points are 8,12,14. In this case, D is enough to cover remaining points.

Marked prime implicants: A,B,D Total Cost: 15

F= a’b + c’d + ad’

**3.**

F= ((a’b + c’d + ad’)’)’ F= [(a’b)’(c’d)’(ad’)’)’]’

