CSS 422: Hardware and Computer Organization

Exercise Set 2: K-Maps

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## Student Name:

# How big will the table be (in row x column) format if we have 5 input variables ( A,B,C,D,E) ?

Answer: 2^5

# Given this K-map. Minimize it

|  |  |  |  |
| --- | --- | --- | --- |
| A | B | C | Result |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 |  |
| 1 | 1 | 1 |  |

Fill in this table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | !A!B | !AB | AB | A!B |
| !C | 1 | 1 |  | 1 |
| C | 1 | 1 |  | 1 |

Answer: !A + !B (2 big 4 elements loop)

Without using the K-Map, try to do it by yourself looking at the output. Show steps by steps solution

Output = !A!B!C + !A!BC + !AB!C + !ABC + A!B!C + A!BC

= !A!B ( !C + C) + !AB (!C + C) + A!B(!C + C)

= !A!B + !AB + A!B

= !A!B + !AB + !A!B + A!B

= !A(!B + B) + !B(!A+A)

= !A + !B

# Don’t care Kmaps. This exercise will involve K map operation that have an X in it. An X can be called a don’t care in which you can either use it as a 1 or 0

Given the following table, create K map table for each value and determine the equation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| INPUT | | | | OUTPUT | | |
| A | B | C | D | Answer 1 | Answer 2 | Answer 3 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | X |
| 0 | 0 | 1 | 1 | 0 | 1 | X |
| 0 | 1 | 0 | 0 | 0 | X | 0 |
| 0 | 1 | 0 | 1 | 1 | X | 0 |
| 0 | 1 | 1 | 0 | 0 | X | X |
| 0 | 1 | 1 | 1 | 1 | X | X |
| 1 | 0 | 0 | 0 | X | 0 | 0 |
| 1 | 0 | 0 | 1 | X | 1 | 0 |
| 1 | 0 | 1 | 0 | X | 0 | X |
| 1 | 0 | 1 | 1 | X | 1 | X |
| 1 | 1 | 0 | 0 | X | X | 0 |
| 1 | 1 | 0 | 1 | X | X | 1 |
| 1 | 1 | 1 | 0 | X | X | X |
| 1 | 1 | 1 | 1 | X | X | X |

Answer 1 = BD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | !A!B | !AB | AB | A!B |
| !C!D |  |  | X | X |
| !CD |  | 1 | X | X |
| CD |  | 1 | X | X |
| C!D |  |  | X | X |

Answer 2 = D

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | !A!B | !AB | AB | A!B |
| !C!D |  | X | X |  |
| !CD | 1 | X | X | 1 |
| CD | 1 | X | X | 1 |
| C!D |  | X | X |  |

Answer 3 = ABD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | !A!B | !AB | AB | A!B |
| !C!D |  |  |  |  |
| !CD |  |  | 1 |  |
| CD | X | X | X | X |
| C!D | X | X | X | X |