

# Övningsexempel på karnaughdiagram

Tag fram minimala SP-uttryck ur karnaughdiagrammen nedan! (Ettorna!)

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_1$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 0  | 0  | 1  |
|    | 01    | 0  | 1  | 1  | 0  |
|    | 11    | 0  | 1  | 1  | 0  |
|    | 10    | 1  | 0  | 0  | 1  |

$f_1 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_2$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 1  | 1  | 1  |
|    | 01    | 0  | 1  | 1  | 0  |
|    | 11    | 0  | 0  | 0  | 0  |
|    | 10    | 0  | 0  | 0  | 0  |

$f_2 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_3$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 0  | 0  | 1  |
|    | 01    | 1  | 1  | 1  | 1  |
|    | 11    | 1  | 1  | 1  | 1  |
|    | 10    | 1  | 0  | 0  | 1  |

$f_3 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_4$ | 00 | 01 | 11 | 10 |
|    | 00    | 0  | 1  | 1  | 0  |
|    | 01    | 0  | 1  | 1  | 1  |
|    | 11    | 0  | 1  | 1  | 1  |
|    | 10    | 0  | 0  | 0  | 0  |

$f_4 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_5$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 1  | 1  | 1  |
|    | 01    | 1  | 1  | 1  | 1  |
|    | 11    | 0  | 0  | 0  | 0  |
|    | 10    | 0  | 1  | 1  | 0  |

$f_5 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_6$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 1  | 1  | 1  |
|    | 01    | 1  | 1  | 1  | 1  |
|    | 11    | 1  | 1  | 1  | 1  |
|    | 10    | 1  | 0  | 0  | 1  |

$f_6 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_7$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 0  | 0  | 1  |
|    | 01    | 1  | 1  | 1  | 1  |
|    | 11    | 0  | 1  | 1  | 0  |
|    | 10    | 1  | 0  | 0  | 1  |

$f_7 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_8$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 0  | 0  | 1  |
|    | 01    | 0  | 1  | 1  | 0  |
|    | 11    | 0  | 1  | 1  | 0  |
|    | 10    | 1  | 1  | 1  | 1  |

$f_8 =$

|    |       | ZW |    |    |    |
|----|-------|----|----|----|----|
| xy | $f_9$ | 00 | 01 | 11 | 10 |
|    | 00    | 1  | 0  | 0  | 1  |
|    | 01    | 0  | 1  | 0  | 0  |
|    | 11    | 0  | 0  | 1  | 0  |
|    | 10    | 1  | 0  | 0  | 1  |

$f_9 =$

**Svar:**

$$f_1 = y'w' + yw$$

$$f_2 = x'y' + x'w$$

$$f_3 = y + w'$$

$$f_4 = x'w + yw + yz$$

$$f_5 = x' + y'w$$

$$f_6 = x' + y + w'$$

$$f_7 = y'w' + yw + x'y$$

$$f_8 = y'w' + yw + xw$$

$$f_9 = y'w' + x'yz'w + xyzw$$

alternativt

$$f_7 = y'w' + yw + x'w'$$

$$f_8 = y'w' + yw + xy'$$

Tag fram minimala PS-uttryck ur karnaughdiagrammen nedan! (Nollorna!)

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>10</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 0  | 0  | 1  |
|    | 01              | 0  | 1  | 1  | 0  |
|    | 11              | 0  | 1  | 1  | 0  |
|    | 10              | 1  | 0  | 0  | 1  |

f<sub>10</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>11</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 1  | 1  | 1  |
|    | 01              | 0  | 1  | 1  | 0  |
|    | 11              | 0  | 0  | 0  | 0  |
|    | 10              | 0  | 0  | 0  | 0  |

f<sub>11</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>12</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 0  | 0  | 1  |
|    | 01              | 1  | 1  | 1  | 1  |
|    | 11              | 1  | 1  | 1  | 1  |
|    | 10              | 1  | 0  | 0  | 1  |

f<sub>12</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>13</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 0  | 1  | 1  | 0  |
|    | 01              | 0  | 1  | 1  | 1  |
|    | 11              | 0  | 1  | 1  | 1  |
|    | 10              | 0  | 0  | 0  | 0  |

f<sub>13</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>14</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 1  | 1  | 1  |
|    | 01              | 1  | 1  | 1  | 1  |
|    | 11              | 0  | 0  | 0  | 0  |
|    | 10              | 0  | 1  | 1  | 0  |

f<sub>14</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>15</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 1  | 1  | 1  |
|    | 01              | 1  | 1  | 1  | 1  |
|    | 11              | 1  | 1  | 1  | 1  |
|    | 10              | 1  | 0  | 0  | 1  |

f<sub>15</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>16</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 0  | 0  | 1  |
|    | 01              | 1  | 1  | 1  | 1  |
|    | 11              | 0  | 1  | 1  | 0  |
|    | 10              | 1  | 0  | 0  | 1  |

f<sub>16</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>17</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 0  | 0  | 1  |
|    | 01              | 0  | 1  | 1  | 0  |
|    | 11              | 0  | 1  | 1  | 0  |
|    | 10              | 1  | 1  | 1  | 1  |

f<sub>17</sub> =

|    |                 | ZW |    |    |    |
|----|-----------------|----|----|----|----|
| xy | f <sub>18</sub> | 00 | 01 | 11 | 10 |
|    | 00              | 1  | 0  | 0  | 1  |
|    | 01              | 0  | 1  | 0  | 0  |
|    | 11              | 0  | 0  | 1  | 0  |
|    | 10              | 1  | 0  | 0  | 1  |

f<sub>18</sub> =

**Svar:**

$$f_{10} = (y' + w)(y + w')$$

$$f_{13} = (y + w)(z + w)(x' + y)$$

$$f_{16} = (y + w')(x' + y' + w)$$

$$f_{18} = (y' + w)(y + w')(x' + y' + z)(x + y' + z') \text{ eller}$$

$$f_{18} = (y' + w)(y + w')(x' + y' + z)(x + z' + w') \text{ eller}$$

$$f_{18} = (y' + w)(y + w')(x' + z + w')(x + y' + z') \text{ eller}$$

$$f_{18} = (y' + w)(y + w')(x' + z + w')(x + z' + w')$$

$$f_{11} = x'(y' + w)$$

$$f_{14} = (x' + y')(x' + w)$$

$$f_{17} = (y' + w)(x + y + w')$$

$$f_{12} = y + w'$$

$$f_{15} = x' + y + w'$$