Lösningsförslag till dugga 2 i TMEL53 Digitalteknik 2014-02-04

1a) $F = \overline{\bar{A}\bar{B}D} \cdot \overline{A\bar{B}C} \cdot \overline{\bar{B}\bar{C}D} \cdot \overline{\bar{B}C\bar{D}}$

| A B C D | $\bar{A}\bar{B}D$ | $A\bar{B}C$ | $\bar{B}\bar{C}D$ | $\bar{B}C\bar{D}$ | F |
|---|---|---|---|---|---|
| 0 0 0 0 | 1 | 1 | 1 | 1 | 1 |
| 0 0 0 1 | 0 | 1 | 0 | 1 | 0 |
| 0 0 1 0 | 1 | 1 | 1 | 0 | 0 |
| 0 0 1 1 | 0 | 1 | 1 | 1 | 0 |
| 0 1 0 0 | 1 | 1 | 1 | 1 | 1 |
| 0 1 0 1 | 1 | 1 | 1 | 1 | 1 |
| 0 1 1 0 | 1 | 1 | 1 | 1 | 1 |
| 0 1 1 1 | 1 | 1 | 1 | 1 | 1 |
| 1 0 0 0 | 1 | 1 | 1 | 1 | 1 |
| 1 0 0 1 | 1 | 1 | 0 | 1 | 0 |
| 1 0 1 0 | 1 | 0 | 1 | 0 | 0 |
| 1 0 1 1 | 1 | 0 | 1 | 1 | 0 |
| 1 1 0 0 | 1 | 1 | 1 | 1 | 1 |
| 1 1 0 1 | 1 | 1 | 1 | 1 | 1 |
| 1 1 1 0 | 1 | 1 | 1 | 1 | 1 |
| 1 1 1 1 | 1 | 1 | 1 | 1 | 1 |

1b) FÖRENKLING SKER LÄTTAST GENOM ATT RITA ETT KARNAUGHDIAGRAM.

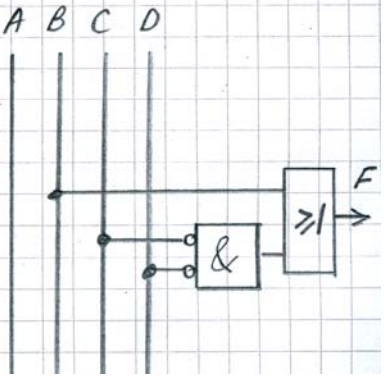
ALT. / RINGA IN 1:OR

| AB \ CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 1 | 0 | 0 | 0 |
| 01 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 |
| 10 | 1 | 0 | 0 | 0 |

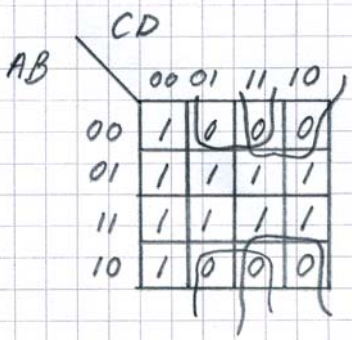
$$F = B + \bar{C}\bar{D}$$

MINIMAL SP-FORM

(DISJUNKTIV MINFORM)



ALT 2. RINGA 0:OR

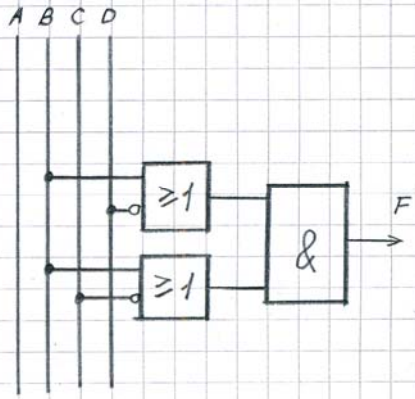



$$\bar{F} = \bar{B}D + \bar{B}C \rightarrow$$

$$F = \overline{\bar{B}D + \bar{B}C} =$$

$$= \overline{\bar{B}D} \cdot \overline{\bar{B}C} =$$

$$= (B + \bar{D})(B + \bar{C})$$




MINIMAL PS-FORM
(KONJUNKTIV MINFORM)

ALT 3. ANVÄND BOOLESK ALGEBRA

$$F = \overline{A\bar{B}D} \cdot \overline{A\bar{B}C} \cdot \overline{\bar{B}\bar{C}D} \cdot \overline{\bar{B}C\bar{D}} =$$

$$= (A + B + \bar{D})(\bar{A} + B + \bar{C})(B + C + \bar{D})(B + \bar{C} + D) =$$

$$= (\underbrace{A\bar{A}}_{0} + AB + A\bar{C} + \bar{A}B + \underbrace{B}_{B}B + B\bar{C} + \bar{A}\bar{D} + B\bar{D} + \bar{C}\bar{D}) \cdot$$

$$\cdot (\underbrace{B}_{B}B + B\bar{C} + BD + BC + \underbrace{\bar{C}}_{0}C + CD + B\bar{D} + \bar{C}\bar{D} + \underbrace{D}_{0}\bar{D}) =$$

$$= (B(\underbrace{A + \bar{A} + 1 + \bar{C} + \bar{D}}_{1}) + \underbrace{A\bar{C} + \bar{A}\bar{D} + \bar{C}\bar{D}}_{\text{CONSENSUS}}) \cdot$$

$$\cdot (B(\underbrace{1 + \bar{C} + D + C + \bar{D}}_{1}) + CD + \bar{C}\bar{D}) =$$

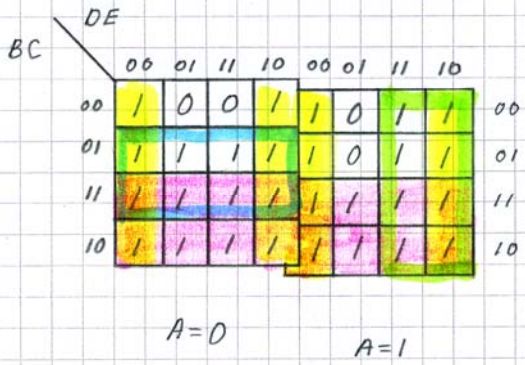
$$= (B + A\bar{C} + \bar{A}\bar{D})(B + CD + \bar{C}\bar{D}) =$$

$$= BB + BCD + B\bar{C}\bar{D} + AB\bar{C} + \underbrace{AC\bar{C}D}_{0} + \underbrace{AC\bar{C}\bar{D}}_{A\bar{C}\bar{D}} + \bar{A}B\bar{D} + \underbrace{\bar{A}CD\bar{D}}_{0} + \underbrace{\bar{A}C\bar{D}\bar{D}}_{\bar{A}\bar{C}\bar{D}} =$$

$$= B(\underbrace{1 + CD + \bar{C}\bar{D} + A\bar{C} + A\bar{D}}_{1}) + (A + \bar{A})\bar{C}\bar{D}$$

$$= B + \bar{C}\bar{D}$$

2.




A=0 A=1

$$F = B + \bar{E} + C\bar{A} + DA$$