State assignment:-

	00	01	11	10
1	1,0	4,0	5,0	1,0
4	7,0	4,0	4,0	4,1
5	7,1	4,0	5,0	5,0
7	7,0	2,0	5,0	7,0
2	1,1	2,0	2,1	2,0.

HW6:-

S.O.P:-

cd \ ab	00	01	11	10
00	1	1	1	1
01	1	1	1	0
11	0	1	1	0
10	0	0	1	1

ON-set = { $\bar{a}\bar{b}\bar{c}\bar{d}$, $\bar{a}\bar{b}\bar{c}d$, $\bar{a}b\bar{c}\bar{d}$, $\bar{a}b\bar{c}d$, $\bar{a}bcd$, $ab\bar{c}\bar{d}$, $ab\bar{c}d$, $abcd$, $abc\bar{d}$, $a\bar{b}\bar{c}\bar{d}$, $a\bar{b}\bar{c}d$ }

OFF-set = { $\bar{a}\bar{b}cd$, $\bar{a}b\bar{c}d$, $\bar{a}bcd$, $a\bar{b}\bar{c}d$, $a\bar{b}cd$ }.

$$CS(f) = abs\left(\left[x_1 + CS(f)(0, x_2 \ldots x_n)\right] \cdot \left[\bar{x}_1 + CS(f)(1, x_2 \ldots x_n)\right]\right)$$

$$f(a,b,c,d) = \bar{c}\bar{d} + ab + bd + \bar{a}\bar{c} + a\bar{d}.$$

$f(a,b,c,d) = \bar{c}\bar{d} + ab + bd + \bar{a}\bar{c} + a\bar{d}$

$f(0,b,c,d) = \bar{c}\bar{d} + bd + \bar{c}$

$f(0,b,c,0) = \bar{c}$

$f(0,b,c,1) = b + \bar{c}$

$cs(f(0,b,c,d)) = abs((\bar{d} + b + \bar{c})(d + \bar{c}))$

$= abs(\bar{c}\bar{d} + bd + b\bar{c} + d\bar{c} + \bar{c})$

$= \bar{c}\bar{d} + bd + \bar{c} + bd.$

$f(1,b,c,d) = \bar{c}\bar{d} + b + bd + \bar{d}$

$f(1,0,c,d) = \bar{d} + \bar{c}\bar{d} = \bar{d}.$

$f(1,1,c,d) = 1$

$cs(f(1,b,c,d)) = abs((\bar{b}+1)(b+\bar{d}))$

$= abs(\bar{b}\bar{d} + b + \bar{d})$

$= b + \bar{d}$

$cs(f(a,b,c,d)) = abs((\bar{a} + b + \bar{d})(a + \bar{c} + bd))$

$CS(f(a,b,c,d)) = abs(\bar{a}\bar{c} + \bar{a}bd + ab + b\bar{c} + bd + a\bar{d} + \bar{c}\bar{d})$.

$CS(f(a,b,c,d)) = \bar{a}\bar{c} + ab + b\bar{c} + bd + a\bar{d} + \bar{c}\bar{d}$.

5.9.2:-

	$\bar{a}\bar{c}$	ab	$b\bar{c}$	bd	$a\bar{d}$	$\bar{c}\bar{d}$
$\bar{a}b\bar{c}\bar{d}$	1	0	0	0	0	1
$\bar{a}b\bar{c}d$	1	0	0	0	0	0
$\bar{a}bc\bar{d}$	1	0	1	0	0	1
$\bar{a}bcd$	1	0	1	1	0	0
$a\bar{b}\bar{c}\bar{d}$	0	0	0	1	0	0
$a\bar{b}\bar{c}d$	0	1	1	0	1	1
$a\bar{b}cd$	0	1	1	1	0	0
$a\bar{b}c\bar{d}$	0	1	0	1	0	0
$ab\bar{c}\bar{d}$	0	1	0	0	1	0
$ab\bar{c}d$	0	0	0	0	1	1
$abc\bar{d}$	0	0	0	0	1	0

$= \{\bar{a}\bar{c} + bd + a\bar{d}\}$.

5.9.3:-

The list of implicants will be the same as minimal implicants covering all ON-set.

$= \{bd + a\bar{d} + ab + \bar{a}\bar{c} + \bar{c}\bar{d}\}$.

5.9.4:-

T_1 → Static 1 with $\bar{a}\bar{c}$.
T_2 → dynamic 1-0 with $a\bar{c}$
T_3 → dynamic 0→1 with $\bar{a}c$
T_4 → dynamic 1→0 with ac.

5.9.5:-

T_1 → $\{\bar{a}\bar{c}\}$
T_2 → $\{a\bar{c}\bar{d}, ab\bar{c}\}$
T_3 → $\{\bar{a}bcd\}$
T_4 → $\{abc, ac\bar{d}\}$.

5.9.6:-

T_1 → $\{ac\}$ No privileged cube
T_2 → $\{a\bar{c}\}$
T_3 → $\{\bar{a}c\}$
T_4 → $\{ac\}$.

5.9.7:- No illegal intersection on privileged cube.

priv cube	start subcube
$a\bar{c}$	$ab\bar{c}\bar{d}$
$\bar{a}c$	$\bar{a}bc\bar{d}$
$\bar{a}c$	$abc\bar{d}$

primes	DHF
✓ $\bar{a}\bar{c}$	yes
✓ ab	yes
✓ $b\bar{c}$	yes
bd	no.
✓ $a\bar{d}$	yes
✓ $\bar{c}\bar{d}$	yes
✓ $\bar{a}bd$	yes

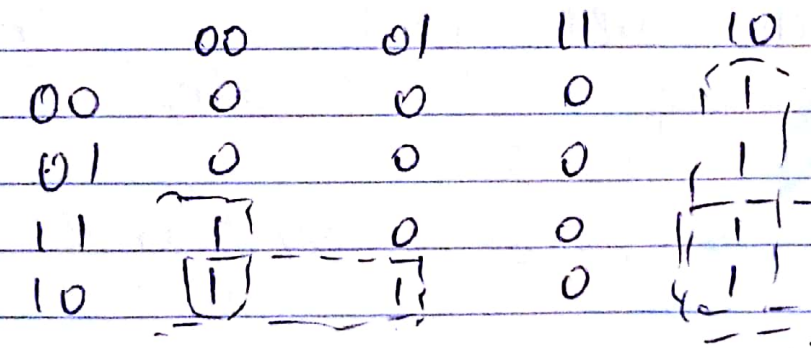
5.9.8:-

$\bar{a}\bar{c} \cdot ab \cdot b\bar{c} \cdot a\bar{d} \cdot \bar{c}\bar{d} \cdot \bar{a}bcd$

$\bar{a}\cdot\bar{c}$	1	–	–	–	–	–
$a\bar{c}\bar{d}$	–	–	–	1	1	–
$ab\bar{c}$	–	1	1	–	–	–
$\bar{a}bcd$	–	–	–	–	–	1
abc	–	1	–	–	–	–
acd	–	–	–	1	–	–

$= \{ \bar{a}\bar{c} + ab + \bar{a}bd + a\bar{d} \}$.

5.10:-



ON-set = $\{ a\bar{b}, b\bar{c}, \bar{a}c\bar{d} \} = \{ a\bar{b}cd, a\bar{b}c\bar{d}, \bar{a}b\bar{c}d, \bar{a}bcd, ab\bar{c}d, ab\bar{c}\bar{d}, abcd, ab\bar{c}\bar{d} \}$

5.10.1.

$f(a,b,c,d) = a\bar{b} + b\bar{c} + \bar{a}c\bar{d}$.

$f(a,b,0,d) = a\bar{b}$

$f(a,b,1,d) = a\bar{b} + b + \bar{a}\bar{d}$

$f(a,0,1,d) = 1$

$f(a,1,1,d) = \bar{a}\bar{d}$.

$f(a,b,1,d) = abs((\bar{b} + \bar{a}\bar{d})(b+1)) = abs(\bar{b} + \bar{a}bd + \bar{a}\bar{d}) = \bar{b} + \bar{a}\bar{d}$

$f(a,b,c,d) = abs((\bar{c} + \bar{b} + \bar{a}\bar{d})(c + a\bar{b}))$.

$= abs(a\bar{b}\bar{c} + \bar{b}c + a\bar{b} + \bar{a}c\bar{d})$

$f(a,b,c,d) = \{ \bar{b}c + a\bar{b} + \bar{a}c\bar{d} \}$.

5.10.1 → $\{a\bar{b}, \bar{b}c, \bar{a}c\bar{d}\}$.

5.10.2 →

	$a\bar{b}$	$\bar{b}c$	$\bar{a}c\bar{d}$
✓ $\bar{a}\bar{b}cd$	0	(1)	0
✓ $\bar{a}\bar{b}c\bar{d}$	0	1	1
$\bar{a}b\bar{c}d$	0	0	(1) ✓
✓ $ab\bar{c}\bar{d}$	(1)	0	0
✓ $a\bar{b}\bar{c}d$	1	0	0
✓ $a\bar{b}cd$	1	1	0
✓ $a\bar{b}c\bar{d}$	1	1	0

$= \{\bar{b}c, a\bar{b}, \bar{a}c\bar{d}\}$.

5.10.3:-

The list will be same as all covering implicants of ON-set

$= \{\bar{b}c, a\bar{b}, \bar{a}c\bar{d}\}$.

5.10.4

T_1 → dynamic 0→1 with $\bar{a}\bar{b}$

T_2 → dynamic 1→0 with $\bar{a}b\bar{d}$

T_3 → dynamic 0→1 with a.

5.10.5 →

required cubes:-

$T_1 = \{\bar{a}bc\}$

$T_2 = \{\bar{a}bc\bar{d}\}$

$T_3 = \{a\bar{b}\}$.

5.10.6:- Privileged cubes

$f_1 \rightarrow$ ~~No privileges~~ $\bar{a}\bar{b}$

$f_2 \rightarrow \bar{a}b\bar{d}$

$f_3 \rightarrow a$

5.10.7:- DHF- prime implicants.

Priv. Cube	start subcube.
$\bar{a}\bar{b}$	$\bar{a}\bar{b}\bar{c}-$
$\bar{a}b\bar{d}$	$\bar{a}b-\bar{d}$
a	$ab--$
Primes	DHF prime.
✓ $a\bar{b}$	yes
$\bar{b}c$	NO. (illegal)
$\bar{a}c\bar{d}$	NO (illegal)
$ab\bar{c}$	NO
✓ $\bar{a}\bar{b}c$	yes
$\bar{a}\bar{b}c\bar{d}$	No (illegal)
✓ $\bar{a}bc\bar{d}$	yes.

$= \{ a\bar{b}, \bar{a}\bar{b}c, \bar{a}bc\bar{d} \}$.

5.10.8:-

	$a\bar{b}$	$\bar{a}\bar{b}c$	$\bar{a}bc\bar{d}$
$\bar{a}\bar{b}c$	⊙-	①	-
$\bar{a}bc\bar{d}$	-	-	①
$a\bar{b}$	①	-	-

$= \{ a\bar{b}, \bar{a}\bar{b}c, \bar{a}bc\bar{d} \}$.