



Introduction to Logic Design

EEF205E

Homework-2

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T	P	L	M	A	V	A
0	0	0	0	0	0	$\checkmark 2$
0	0	0	1	0	1	$\checkmark 5$
0	0	1	0	1	0	$\checkmark 0$
0	0	1	1	0	1	$\checkmark 12$
0	1	0	0	0	1	$\checkmark 14$
0	1	0	1	0	1	
0	1	1	0	1	1	
0	1	1	1	0	1	
1	0	0	0	0	0	$(85,$
1	0	0	1	0	1	$2,10)$
1	0	1	0	1	1	
1	0	1	1	0	1	
1	1	0	0	1	1	
1	1	0	1	0	1	
1	1	1	0	1	1	
1	1	1	1	0	1	

$\checkmark \exists 10001$

$\checkmark 40100$

$\checkmark 30011$

$\checkmark 50101$

$\checkmark 60110$

$\checkmark (1,3)$

$\checkmark (1,5)$

$\checkmark (1,9)$

$\checkmark (4,5)$

$\checkmark (4,6)$

$\checkmark (6,12)$

$00-1$

$0-01$

-001

$010-$

$01-0$

-100

$\checkmark (1,3,5)$

$\checkmark (1,3,9)$

$\checkmark (1,5,3)$

$\checkmark (1,5,9)$

$\checkmark (1,9,3)$

$\checkmark (1,9,11)$

	x	y	z	$x+y+z$	xy	$\overbrace{(x+y+z) \cdot xy}^f$	f'
0	0	0	0	0	0	0	1
0	0	0	1	1	0	0	1
0	1	0	0	1	0	0	1
0	1	0	1	2	0	0	1
0	1	1	0	2	0	0	1
1	0	0	0	1	0	0	1
1	0	1	0	1	0	0	1
1	1	0	0	1	1	1	0
1	1	1	0	2	1	1	0

$$(x+y+z) \cdot xy = x'y' + x'y'z' + x'y'z$$

✓

	x	y	z	x'	y'	z'	$\overbrace{x'y'z'}^f$	$z+x'+y'$
0	0	0	1	1	1	1	1	1
0	0	1	1	1	0	0	0	1
0	1	0	1	0	1	0	0	1
0	1	1	1	0	0	0	0	1
1	0	0	0	1	1	0	0	1
1	0	1	0	1	0	0	0	1
1	1	0	0	0	1	0	0	0
1	1	1	0	0	0	0	0	0

	x	y	z	x'	$x+y+z$	$f \cdot x$	xy	xz	yz
0	0	0	1	1	0	0	0	0	0
0	0	1	1	1	0	0	0	0	0
0	1	0	1	1	0	0	0	0	0
0	1	1	1	1	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	1	0	1	1	0	0	1	xy + yx + zx = xy + xz
1	1	0	0	1	1	1	0	1	1
1	1	1	0	1	2	1	1	1	1

$$(x+y+z) \cdot x = xy + xz$$

$$xy + yx + zx = xy + xz$$

✓

$$2-a = ABC + A'B + ABC'$$

$$\overbrace{ABC}^1 + C' + \overbrace{A'B}^1 = A \cdot B + A' \cdot B$$

$$= BCA + A'$$

$$= B^1$$

$$2-b = (x+y)^1 \cdot (x'+y')$$

$$x'y \cdot x' + y' = \cancel{x'x'y}^1 + \cancel{x'y'y}^1 = \cancel{x'y}^1 + \cancel{x'y}^1 = x'y$$

$$2-c = (xy - x) \cdot (wz + wz') = x(y \cancel{-} 1) \cdot w(2 \cancel{+} 2)$$

$$= x \cdot w$$

$$\begin{aligned}
 2 - d &= (a' + c') \cdot (a + b' + c') = a'_0 a + a'_0 b' + a'_0 c' + a c + b' c + \cancel{c c} \\
 &= a'_0 b' + c'(a' + a) + b' c + c' \\
 &= a'_0 b' + c' + b' c + c' \\
 &= a'_0 b' + c' + b' c \\
 &= b'(a' + c) + c
 \end{aligned}$$

3

a_1	a_0	b_1	b_0	c_2	c_1	c_0
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	1
0	1	1	1	0	1	0
1	0	0	0	0	1	0
1	0	0	1	0	1	1
1	0	1	0	1	0	0
1	0	1	1	0	1	1
1	1	0	0	1	0	0
1	1	0	1	0	1	0
1	1	1	0	1	0	1
1	1	1	1	0	1	1
1	1	0	0	0	1	1
1	1	0	1	1	0	0
1	1	1	0	1	0	1
1	1	1	1	1	1	0

$$C_2 = \sum_m (7, 10, 11, 13, 14, 15)$$

$$C_3 = \sum_m (2, 3, 5, 6, 8, 9, 12, 15)$$

$$C_0 = \sum_m (1, 3, 4, 6, 9, 11, 12, 14)$$

$$\begin{aligned}
 C_2 &= q'_1 q_0 b' b_0 + q_1 q_0' b' b_0' + q_1 q_0' b' b_0 + q_1 q_0 b'_0 b_0' + q_1 q_0 b_1 b_0' \\
 &\quad + q_1 q_0 b_1 b_0
 \end{aligned}$$

$$\begin{aligned}
 C_1 &= q'_1 q'_0 b' b_0' + q'_1 q'_0 b' b_0 + q'_1 q'_0 b' b_0 - q'_1 q'_0 b' b_0' - q'_1 q'_0 b' b_0' + q'_0 b' b_0 + q'_0 b' b_0' \\
 &\quad + q'_1 q_0 b_1 b_0
 \end{aligned}$$

$$\begin{aligned}
 C_0 &= q'_1 q'_0 b'_1 b_0 - q'_1 q'_0 b'_1 b_0 + q'_1 q'_0 b'_1 b_0' - q'_1 q'_0 b'_1 b_0' + q'_1 q'_0 b'_1 b_0 + q'_1 q'_0 b'_1 b_0' + q'_1 q'_0 b'_1 b_0' \\
 &\quad + q'_1 q'_0 b'_1 b_0
 \end{aligned}$$

C₂

$$\checkmark(10,10,10) \quad \checkmark(10,10,10) - D(10,11,14,15) \quad 1-1-$$

$$\checkmark(11) \quad 0-1-1 \quad \checkmark(10,10) \quad 1-1-0 \quad ((10,11,14,15)) \quad 1-1-$$

$$\checkmark(11) \quad 1-0-1 \quad A(2,15) \quad -1-1-1$$

$$\checkmark(11) \quad 1-1-0 \quad C(14,15) \quad 1-1-1$$

$$\checkmark(10) \quad 1-1-0 \quad B(13,15) \quad 1-1-1$$

$$C(14,15) \quad 1-1-1$$

$$\checkmark(15) \quad 1-1-1$$

A @ B C D

2 ✓
10 - ✓
11 - ✓
13 - ✓
14 - ✓ ✓
15 ✓ ✓ ✓ ✓
FR EP FR

$$C_2 = a_0 b_0 b_0 + a_1 a_0 b_0 + a_1 b_0$$

A = 2, 15

B = 13, 15

C = 14, 15

D = (10, 11, 14, 15)

$$A \oplus D \oplus B(C+D)(B+C+D)$$

A=1

D=1

B=1

C=0

C₁

$$\checkmark(10) \quad 0-0-10 \quad C(3,3) \quad 0-0-1-$$

$$\checkmark(10) \quad 1-0-00 \quad D(2,6) \quad 0-1-0$$

$$\checkmark(3) \quad 0-0-11 \quad E(3,3) \quad 1-0-0-$$

$$A(5) \quad 0-1-01 \quad F(8,15) \quad 1-0-00$$

$$\checkmark(6) \quad 0-1-10$$

$$\checkmark(2) \quad 1-0-01$$

$$\checkmark(2) \quad 1-1-00$$

$$B(5) \quad 1-1-11$$

A B C D E F

1 ✓ ✓ ✓

2 - ✓ -

3 ✓ - -

4 - - -

5 ✓ - -

6 - - -

7 - - -

8 - - -

9 - - -

10 - - -

11 - - -

12 - - -

13 - - -

14 - - -

15 - - -

EP1 EP1 EP1 EP1 EP1 EP1

$$C_1 = a_0' a_0 b_0' b_0 + a_1 a_0 b_0' b_0 + a_1' a_0' b_0 - a_1' b_0 b_0' + a_1 a_0' b_1' + a_1' b_0' b_0$$

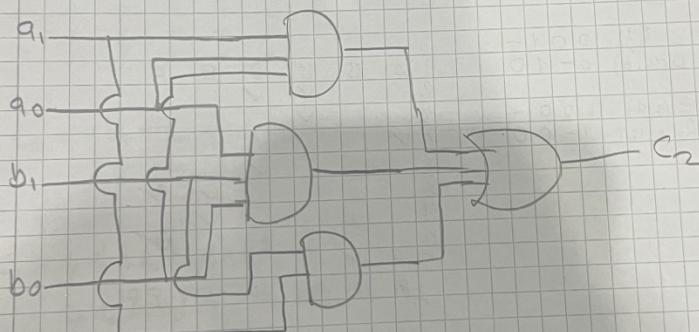
C_0

$$\begin{array}{l} \checkmark(0) \quad 0001 \quad \checkmark(1,3) \quad 00-1 \quad A(1,3,9,11) \quad -0-1 \\ \checkmark(4) \quad 0100 \quad \checkmark(6,9) \quad -001 \quad (9,11) \quad -0-1 \\ \checkmark(10) \quad 1000 \quad \checkmark(4,6) \quad 01-0 \quad B(4,6,12,13) \quad -1-0 \\ \checkmark(3) \quad 0011 \quad \checkmark(9,12) \quad -100 \\ \checkmark(6) \quad 0110 \quad \checkmark(3,11) \quad -011 \\ \checkmark(9) \quad 1001 \quad \checkmark(6,13) \quad -110 \\ \checkmark(12) \quad 1100 \quad \checkmark(9,11) \quad 10-1 \\ \checkmark(13) \quad 1110 \quad \checkmark(12,13) \quad 11-0 \end{array}$$

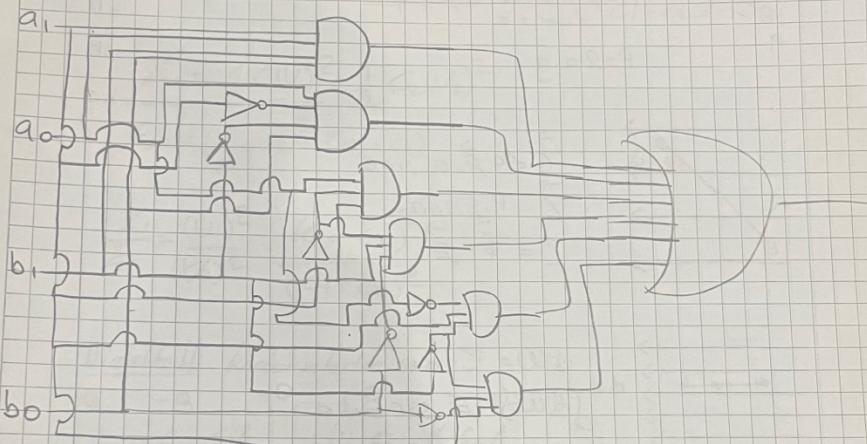
A 1 3 4 6 9 11 12 13
 B ✓ ✓ ✓ ✓ ✓ ✓ FPI
 FPI

$$C_0 = q_0' b_0 + q_0 b_0'$$

$$C_2 = q_0 b_1 b_0 + q_1 q_0 b_0 + q_1 b_1$$

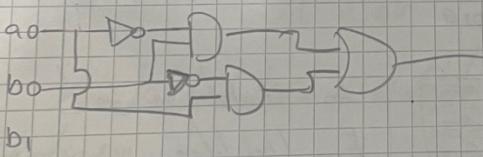


$$C_1 = a_1' q_0 b_1' b_0 + a_1 q_0 b_1 b_0 + a_1' q_0' b_1 + a_1' b_1 b_0' + q_1 q_0' b_1'$$



C_0

a_1



T	P	L	M	A	V	A = $\sum (2, 6, 10, 12, 14) SOP$
0	0	0	0	0	0	$\sqrt{2} 0 0 1 0 \sqrt{2} 6 0 - 1 0$
0	0	0	1	0	1	$\sqrt{2} 1 0 - 0 1 0$
0	0	1	0	1	0	$\sqrt{6} 0 1 1 0 \sqrt{3} 1 4 - 1 1 0$
0	0	1	1	0	-1	$\sqrt{10} 0 1 0 1 0 \sqrt{10} 1 9 1 - 1 0$
0	1	0	0	0	1	$\sqrt{12} 1 1 0 0 \sqrt{12} 4 1 1 - 0$
0	1	0	1	0	1	
0	1	1	0	1	1	
0	1	1	1	0	1	
1	0	0	0	0	0	$\sqrt{14} 1 1 1 0$
1	0	0	0	0	1	$A = \prod_{M=1}^7 (0, 1, 3, 4, 5, 7, 8, 9, 11, 13, 15)$
1	0	0	1	0	1	
1	0	1	0	1	1	$(\sqrt{6}, 10, 14) -- 1 0$
1	0	1	1	0	1	$\sqrt{10} 6, 14) -- 1 0$
1	1	0	0	1	1	
1	1	0	1	0	1	
1	1	1	0	1	1	
1	1	1	1	0	1	
V = $\sum (1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15) SOP$	V = $\sum (0, 2, 8) SOP$	A = $M! \cdot (TP+L)$				
$\sqrt{2} 0 0 0 0 1$	$\sqrt{1, 3}$	0 0 - 1	$\sqrt{1, 3, 5, 7}$	0 - - 1	$A 13579111315 - - - 1$	
$\sqrt{2} 0 1 0 0$	$\sqrt{1, 5}$	0 - 0 1	$\sqrt{1, 3, 9, 11}$	0 - - 1	$13911921315 - - - 1$	
$\sqrt{2} 0 1 0 1$	$\sqrt{1, 9}$	0 - 0 1	$\sqrt{1, 5, 9, 13}$	0 - - 1	$15379111315 - - - 1$	
$\sqrt{2} 0 1 1 0$	$\sqrt{1, 11}$	- 1 0 0	$\sqrt{1, 9, 5, 13}$	- 0 1	$15913371115 - - - 1$	
$\sqrt{2} 0 1 1 1$	$\sqrt{1, 13}$	- 1 1 0	$\sqrt{1, 9, 7, 13}$	- 0 1	$19313571315 - - - 1$	
$\sqrt{2} 0 1 1 2$	$\sqrt{1, 15}$	- 1 1 1	$\sqrt{1, 9, 5, 6, 13}$	0 1 -	$1956712141315 - 1 -$	
$\sqrt{2} 0 1 1 3$	$\sqrt{1, 17}$	- 1 1 1	$\sqrt{1, 9, 5, 6, 7}$	0 1 -	$1956712141315 - 1 -$	
$\sqrt{2} 0 1 1 4$	$\sqrt{1, 19}$	- 1 1 1	$\sqrt{1, 9, 4, 6, 13}$	0 1 -	$1956712141315 - 1 -$	
$\sqrt{2} 0 1 1 5$	$\sqrt{1, 21}$	- 1 1 1	$\sqrt{1, 9, 4, 6, 7}$	0 1 -	$1956712141315 - 1 -$	
$\sqrt{2} 0 1 1 6$	$\sqrt{1, 23}$	- 1 1 1	$\sqrt{1, 9, 4, 12, 6, 13}$	- 1 - 0		
$\sqrt{2} 0 1 1 7$	$\sqrt{1, 25}$	- 1 1 0	$\sqrt{1, 3, 7, 11, 15}$	- - 1 1		
$\sqrt{2} 0 1 1 8$	$\sqrt{1, 27}$	0 1 1 -	$\sqrt{1, 5, 7, 13, 15}$	- 1 - 1		
$\sqrt{2} 0 1 1 9$	$\sqrt{1, 29}$	- 1 1 0	$\sqrt{1, 5, 7, 13, 15}$	- 1 - 1		
$\sqrt{2} 0 1 1 1 0$	$\sqrt{1, 31}$	1 0 - 1	$\sqrt{1, 8, 9, 14, 15}$	- 1 1 -		
$\sqrt{2} 0 1 1 1 1$	$\sqrt{1, 33}$	1 - 0 1	$\sqrt{1, 8, 11, 14, 15}$	- 1 1 -		
$\sqrt{2} 0 1 1 1 2$	$\sqrt{1, 35}$	1 0 1 -	$\sqrt{1, 9, 11, 14, 15}$	1 - - 1		
$\sqrt{2} 0 1 1 1 3$	$\sqrt{1, 37}$	1 - 1 0	$\sqrt{1, 10, 11, 14, 15}$	1 - - 1		
$\sqrt{2} 0 1 1 1 4$	$\sqrt{1, 39}$	1 1 - 0	$\sqrt{1, 12, 13, 14, 15}$	1 1 - -		
$\sqrt{2} 0 1 1 1 5$	$\sqrt{1, 41}$	- 1 1 1	$\sqrt{1, 2, 14, 13, 15}$	1 1 - -		
$\sqrt{2} 0 1 1 1 6$	$\sqrt{1, 43}$	1 - 1 1				
$\sqrt{2} 0 1 1 1 7$	$\sqrt{1, 45}$	1 1 - 1				
$\sqrt{2} 0 1 1 1 8$	$\sqrt{1, 47}$	1 1 1 -				

$$V = A + B + C$$

$$V = M + P + T.L$$

$$A = M$$

$$B = P$$

$$C = T.L$$

b6
in Color
back

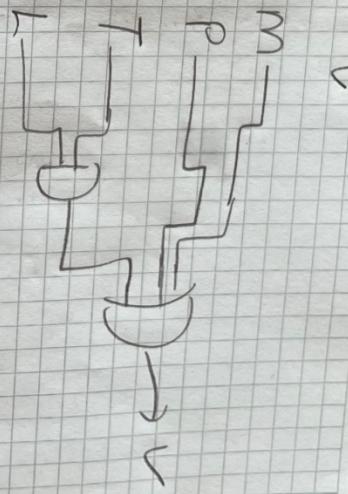
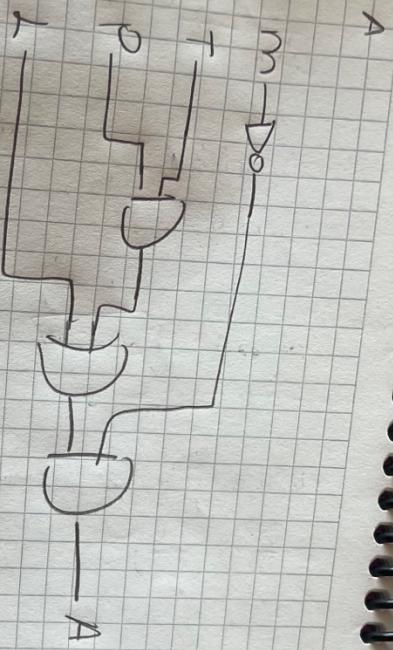
V but with k-map

$P \setminus M$	00	01	11	10
00	0	1	1	0
01	1	1	1	1
11	1	1	1	1
10	0	1	1	1

$$V = P + M + T L$$

$$L \cdot T$$

M



Kashin Color

ChemicalSafety_Dataflow.vhd

```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;

-- Entity declaration for the Chemical Safety System
entity ChemicalSafety_Dataflow is
    Port (
        L : in std_logic; -- Liquid Level (High)
        T : in std_logic; -- Temperature (High)
        P : in std_logic; -- Pressure (High)
        M : in std_logic; -- Manual Override (Active)
        A : out std_logic; -- Alarm (Active)
        V : out std_logic -- Relief Valve (Open)
    );
end ChemicalSafety_Dataflow;

-- Architecture using Dataflow Modeling (Concurrent Assignments)
architecture Dataflow_Logic of ChemicalSafety_Dataflow is
begin
    -- 1. ALARM (A) LOGIC: A = M' AND (L OR (T AND P))
    -- Rule: Alarm is active if Override is inactive (NOT M) AND (Liquid is High
    -- OR (Temp AND Pressure are both High)).
```

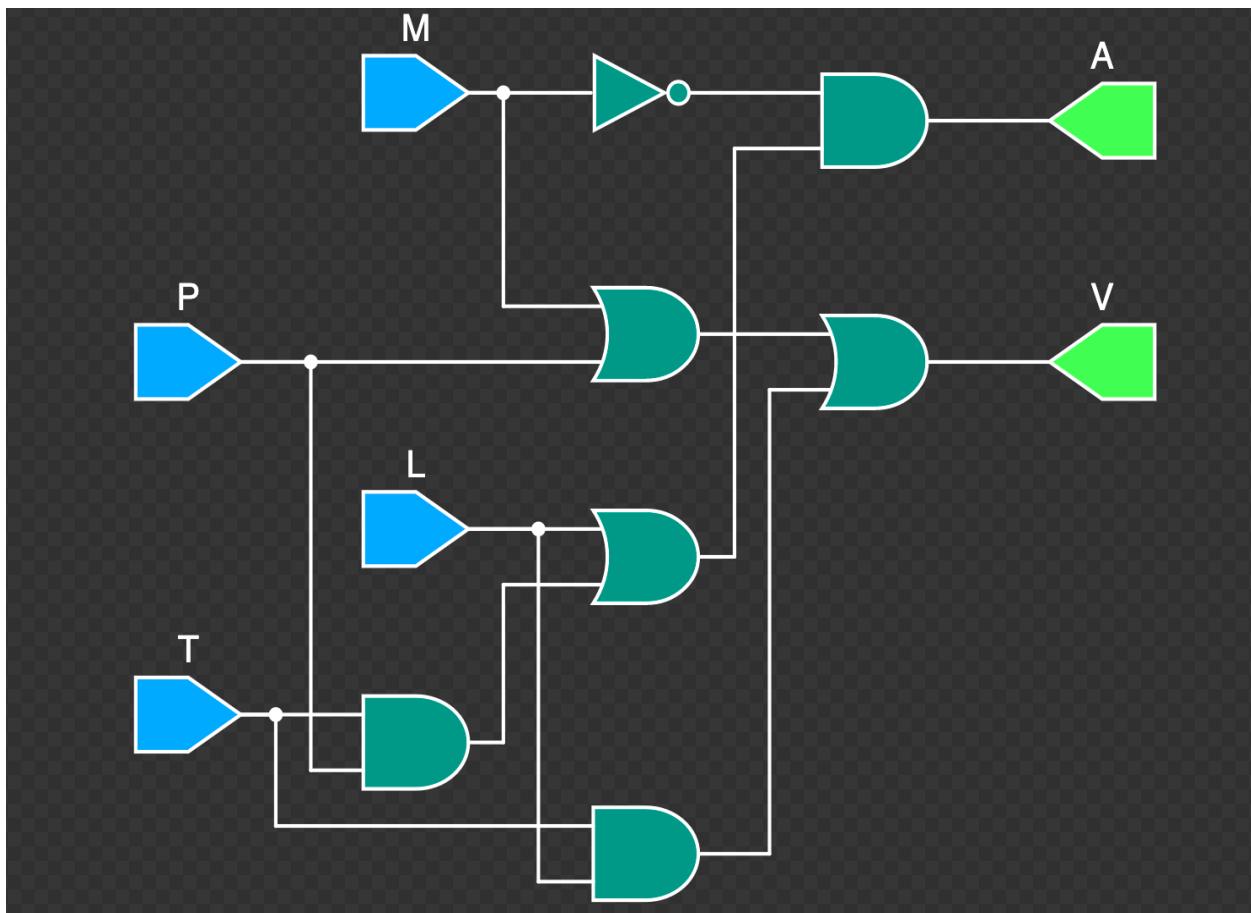
$A \leq (\text{NOT } M) \text{ AND } (L \text{ OR } (T \text{ AND } P));$

-- 2. RELIEF VALVE (V) LOGIC: $V = M \text{ OR } P \text{ OR } (T \text{ AND } L)$

-- Rule: Valve is open if Override is active (M) OR Pressure is High (P) OR (Temperature AND Liquid are both High).

$V \leq M \text{ OR } P \text{ OR } (T \text{ AND } L);$

end Dataflow_Logic;



Inv gate

```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;
entity inv_gate is
    Port (
        I : in STD_LOGIC;
        O : out STD_LOGIC
    );
end inv_gate;
architecture structure of inv_gate is
begin
    O <= not I;
end structure;
```

Or gate

```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;
entity or2_gate is
    Port (
        I1 : in STD_LOGIC;
        I2 : in STD_LOGIC;
        O : out STD_LOGIC
    );

```

```
end or2_gate;

architecture structure of or2_gate is
begin
    O <= I1 or I2;
end structure;
```

and2 gate

```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;
```

```
entity and2_gate is
    Port (
        I1 : in STD_LOGIC;
        I2 : in STD_LOGIC;
        O : out STD_LOGIC
    );
end and2_gate;
```

```
architecture structure of and2_gate is
begin
    O <= I1 and I2;
end structure;
```

```
structural vhds

library IEEE;
use IEEE.STD_LOGIC_1164.ALL;

-- Top-level Entity
entity ChemicalSafety_Structural is
    Port (
        L : in std_logic; -- Liquid Level (High)
        T : in std_logic; -- Temperature (High)
        P : in std_logic; -- Pressure (High)
        M : in std_logic; -- Manual Override (Active)
        A : out std_logic; -- Alarm (Active)
        V : out std_logic -- Relief Valve (Open)
    );
end ChemicalSafety_Structural;

-- Architecture using Structural Modeling
architecture Structural_Logic of ChemicalSafety_Structural is

    -- 1. Component Declarations (Gate Modules)
    component inv_gate
        Port (I : in STD_LOGIC; O : out STD_LOGIC);
    end component;
```

```
end component;
```

```
component and2_gate
```

```
Port (I1 : in STD_LOGIC; I2 : in STD_LOGIC; O : out STD_LOGIC);
```

```
end component;
```

```
component or2_gate
```

```
Port (I1 : in STD_LOGIC; I2 : in STD_LOGIC; O : out STD_LOGIC);
```

```
end component;
```

```
-- 2. Internal Signals (Wires) for interconnecting the components
```

```
signal s_not_M    : std_logic; -- M' for Alarm
```

```
signal s_TP       : std_logic; -- T AND P
```

```
signal s_L_or_TP : std_logic; -- L OR (T AND P)
```

```
signal s_TL       : std_logic; -- T AND L
```

```
signal s_M_or_P   : std_logic; -- M OR P (Intermediate for V)
```

```
begin
```

```
-- A: ALARM LOGIC (A = M' AND (L OR (T AND P)))
```

-- U1: NOT M (M')

U1_NOT_M : inv_gate

port map (I => M, O => s_not_M);

-- U2: T AND P (s_TP)

U2_AND_TP : and2_gate

port map (I1 => T, I2 => P, O => s_TP);

-- U3: L OR s_TP (s_L_or_TP)

U3_OR_L_TP : or2_gate

port map (I1 => L, I2 => s_TP, O => s_L_or_TP);

-- U4: M' AND s_L_or_TP (Final A output)

U4_AND_A : and2_gate

port map (I1 => s_not_M, I2 => s_L_or_TP, O => A);

-- V: RELIEF VALVE LOGIC (V = M OR P OR (T AND L))

-- U5: T AND L (s_TL)

U5_AND_TL : and2_gate

port map (I1 => T, I2 => L, O => s_TL);

-- U6: M OR P (s_M_or_P)

U6_OR_MP : or2_gate

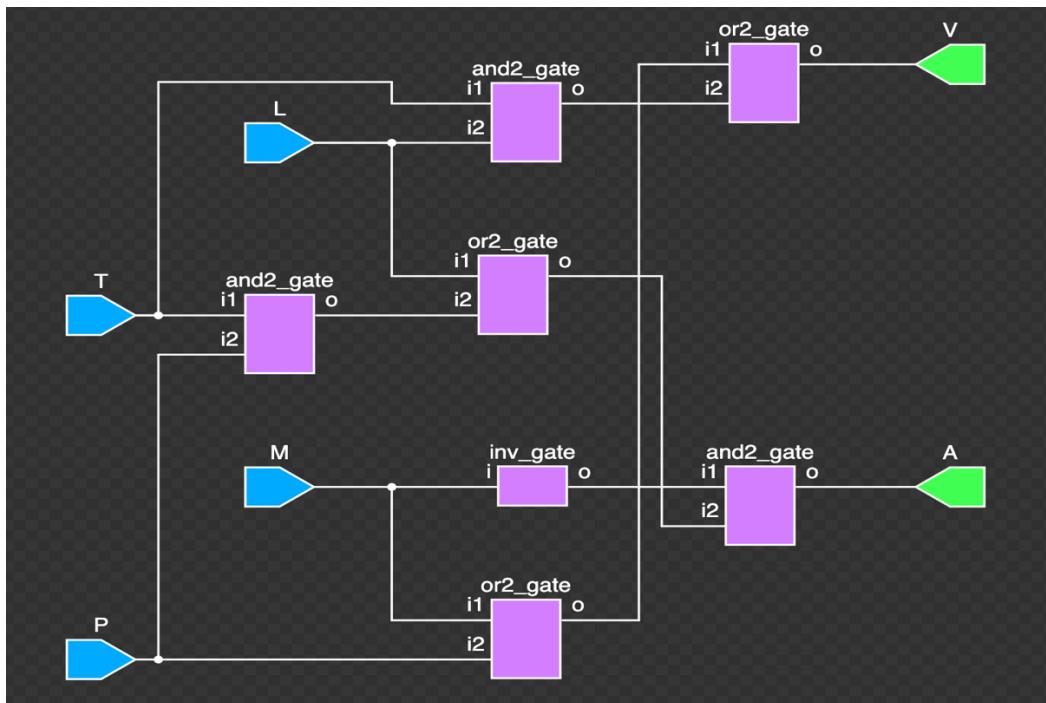
port map (I1 => M, I2 => P, O => s_M_or_P);

-- U7: s_M_or_P OR s_TL (Final V output)

U7_OR_V : or2_gate

port map (I1 => s_M_or_P, I2 => s_TL, O => V);

end Structural_Logic;



testbench

```
library IEEE;  
use IEEE.STD_LOGIC_1164.ALL;
```

```
entity ChemicalSafety_Dataflow_tb is  
    -- Testbench does not have any ports  
end ChemicalSafety_Dataflow_tb;
```

```
architecture Behavioral of ChemicalSafety_Dataflow_tb is
```

```
-- Component Declaration for the Design Under Test (DUT)  
component ChemicalSafety_Dataflow  
    Port (  
        L : in std_logic;  
        T : in std_logic;  
        P : in std_logic;  
        M : in std_logic;  
        A : out std_logic;  
        V : out std_logic  
    );  
end component;
```

```
-- Internal Signals for input and output ports
signal L_tb, T_tb, P_tb, M_tb : std_logic := '0';
signal A_tb, V_tb      : std_logic;

-- Clock period definition (Time constant for simulation)
constant C_CLK_PERIOD : time := 10 ns;

begin

-- Instantiate the Design Under Test (DUT)
DUT : ChemicalSafety_Dataflow
port map (
    L => L_tb,
    T => T_tb,
    P => P_tb,
    M => M_tb,
    A => A_tb,
    V => V_tb
);

-- Process to generate the test vectors
P_TEST_VECTORS: process
```

```
begin
    -- Input order for vectors: M, L, T, P (standard binary sequence)

    -- M L T P (Decimal) | A_exp | V_exp | Description

    -- State 0: 0000 | 0 | 0
    M_tb <= '0'; L_tb <= '0'; T_tb <= '0'; P_tb <= '0'; wait for C_CLK_PERIOD;

    -- State 1: 0001 | 0 | 1
    M_tb <= '0'; L_tb <= '0'; T_tb <= '0'; P_tb <= '1'; wait for C_CLK_PERIOD;

    -- State 2: 0010 | 0 | 0
    M_tb <= '0'; L_tb <= '0'; T_tb <= '1'; P_tb <= '0'; wait for C_CLK_PERIOD;

    -- State 3: 0011 | 1 | 1 (A is active: T.P=1)
    M_tb <= '0'; L_tb <= '0'; T_tb <= '1'; P_tb <= '1'; wait for C_CLK_PERIOD;

    -- State 4: 0100 | 1 | 0 (A is active: L=1)
    M_tb <= '0'; L_tb <= '1'; T_tb <= '0'; P_tb <= '0'; wait for C_CLK_PERIOD;

    -- State 5: 0101 | 1 | 1 (A:L=1; V:P=1)
    M_tb <= '0'; L_tb <= '1'; T_tb <= '0'; P_tb <= '1'; wait for C_CLK_PERIOD;
```

-- State 6: 0110 | 1 | 1 (A:L=1; V:T.L=1)
M_tb <= '0'; L_tb <= '1'; T_tb <= '1'; P_tb <= '0'; wait for C_CLK_PERIOD;

-- State 7: 0111 | 1 | 1 (All sensors high)
M_tb <= '0'; L_tb <= '1'; T_tb <= '1'; P_tb <= '1'; wait for C_CLK_PERIOD;

-- States 8-15: M=1 (Override)

-- State 8: 1000 | 0 | 1 (V is active: M=1)
M_tb <= '1'; L_tb <= '0'; T_tb <= '0'; P_tb <= '0'; wait for C_CLK_PERIOD;

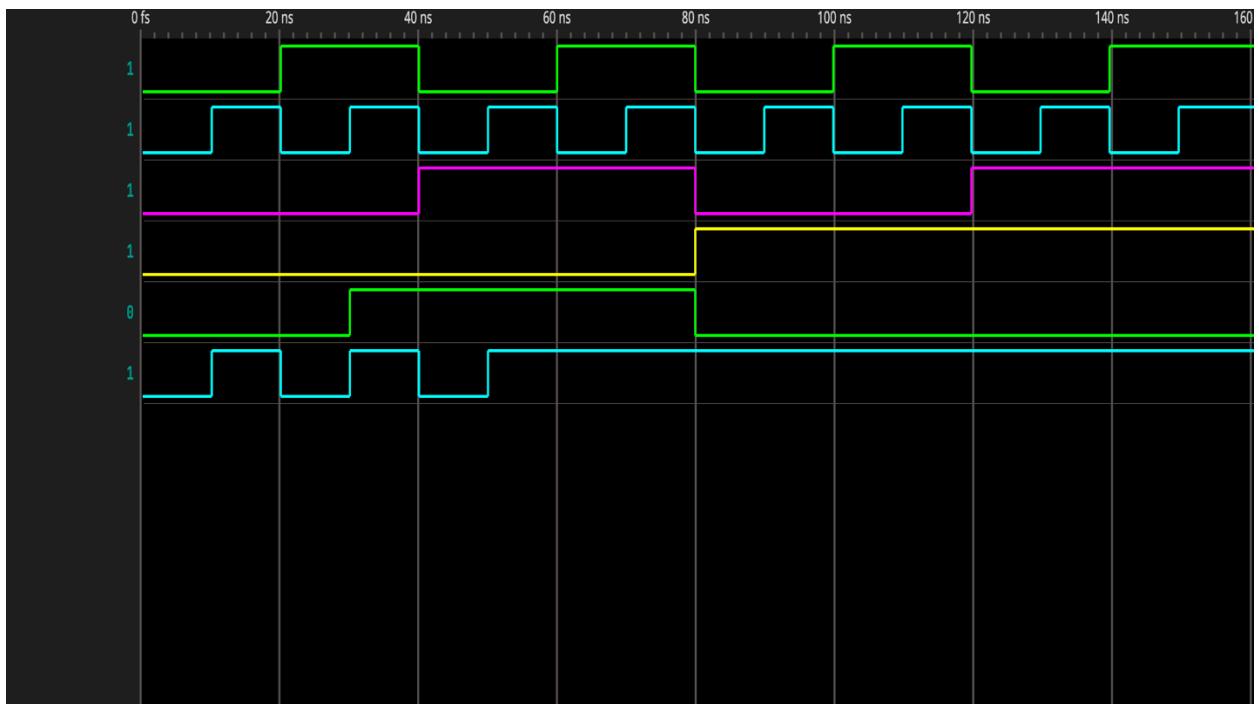
-- State 9: 1001 | 0 | 1
M_tb <= '1'; L_tb <= '0'; T_tb <= '0'; P_tb <= '1'; wait for C_CLK_PERIOD;

-- State 10: 1010 | 0 | 1
M_tb <= '1'; L_tb <= '0'; T_tb <= '1'; P_tb <= '0'; wait for C_CLK_PERIOD;

-- State 11: 1011 | 0 | 1
M_tb <= '1'; L_tb <= '0'; T_tb <= '1'; P_tb <= '1'; wait for C_CLK_PERIOD;

-- State 12: 1100 | 0 | 1

```
M_tb <= '1'; L_tb <= '1'; T_tb <= '0'; P_tb <= '0'; wait for C_CLK_PERIOD;  
  
-- State 13: 1101 | 0 | 1  
M_tb <= '1'; L_tb <= '1'; T_tb <= '0'; P_tb <= '1'; wait for C_CLK_PERIOD;  
  
-- State 14: 1110 | 0 | 1  
M_tb <= '1'; L_tb <= '1'; T_tb <= '1'; P_tb <= '0'; wait for C_CLK_PERIOD;  
  
-- State 15: 1111 | 0 | 1  
M_tb <= '1'; L_tb <= '1'; T_tb <= '1'; P_tb <= '1'; wait for C_CLK_PERIOD;  
  
-- End of simulation  
wait;  
end process;  
  
end Behavioral;
```



<https://github.com/unlumehmet30/it--eef-205e-homeworks>