

Assignment

Q1. Gate delay = 2 ns

$$\text{Delay} = [6 + 2(\log 256)] \times 2 (\approx 28 \text{ ns})$$

Q2. AND delay $\rightarrow t_p$

XOR delay $\rightarrow t_{pr}$

OR delay $\rightarrow t_q$

$$C_0 = t_p + t_q$$

$$C_1 = 2(t_p + t_q)$$

$$C_2 = 3(t_p + t_q)$$

$$S_0 = 2t_p$$

$$S_1 = t_p + t_q + 2t_r$$

$$S_2 = 2t_p + t_q + 2t_r$$

$$S_3 = 8t_p + 3t_q + 2t_r$$

$$\text{Delay} = (n-1)(t_p + t_q) + 2t_r$$

Q3.

$$\begin{array}{r}
 & 11 \cdot 00 \quad 11 \cdot 10 \\
 \begin{array}{r}
 1 \quad 0 \\
 0 \quad 1
 \end{array} & \oplus = 0 \\
 \begin{array}{r}
 0 \quad 1 \\
 1 \quad 0
 \end{array} & \oplus = 1 \\
 \hline
 & 11 \cdot 11 \quad 0x \quad 10 \quad 00 \quad 01 \quad 10
 \end{array}$$

Solub

$$\begin{array}{l}
 Q4. C_1 = G_0 + P_0 C_0 \rightarrow 1 \text{ and } 1 \text{ or gate} \\
 C_2 = G_1 + P_1 G_0 + P_1 P_0 C_0 \rightarrow 2 \text{ and } 1 \text{ or gate} \\
 C_3 = G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_0 \rightarrow 3 \text{ and } 1 \text{ or gate} \\
 C_4 \rightarrow 4 \text{ and } 1 \text{ or gate}
 \end{array}$$

$$\begin{aligned}
 \therefore 1+2+3+4 &= \{10 \text{ and gate}\} \\
 1+1+1+1 &= \{4 \text{ or gate}\}
 \end{aligned}$$

Q5. $(67.25)_{10} - (38.26)_{10}$

$$\begin{array}{r} 9999 \\ - 3826 \\ \hline 6173 \end{array}$$

$6173 \leftarrow 9's \text{ complement}$

$6174 \leftarrow 10's \text{ complement}$

$w_3 \rightarrow (6174)_{10} \rightarrow \text{stage 1.}$

10. $BCD_{\min} = (27.25)_{10} = 00100111.00100101$

$BCD_{\text{sub}} = (61.74)_{10} = 01100001.01110100$

add. = $\begin{array}{r} 0001000.10011001 \\ + 01100001.01110100 \\ \hline \end{array}$
no carry

\therefore negative number.

= $(88.99)_{10} \rightarrow \text{Stage 2.}$

10's complement = $(11.01)_{10} \rightarrow \text{stage 3.}$

Sign = 1 (negative).

Q6 (a).

$$\begin{aligned} F &= A(B+C) = AB+AC = A(A+B)(C+C') + A(B+B')C \\ &= ABC + ABC' + ABC + AB'C \\ &= ABC + ABC' + AB'C. \end{aligned}$$

$D_0 = D_1 = D_2 = D_3 = D_4 = 0.$

$D_5 = D_6 = D_7 = 1.$

(b) # of select lines = 1: 8192 demux.

$$\log_2 (8192) = 13$$

(C) $2^n : 1$

mux using 2:1 mux.

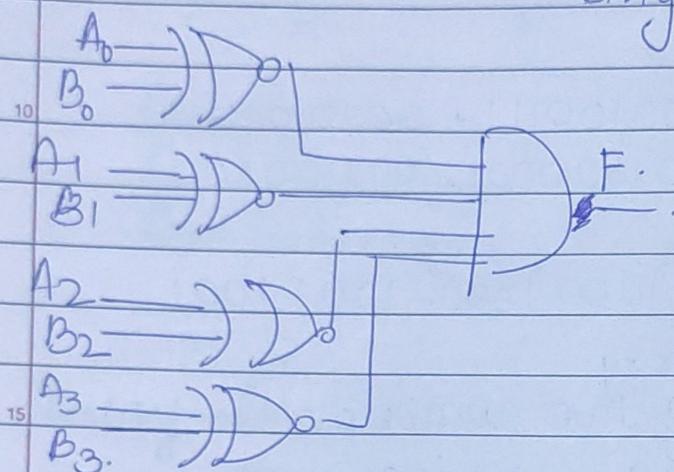
$$\frac{2^{n+1} + 2^{n-2}}{2-1} - 2^1 = \frac{2^n - 1}{2-1} = \boxed{2^n - 1}$$

(D) 2048:1 mux using 8:1 mux

$$256 + 32 + 4 + 6 = \underline{\underline{293}}$$

Q3. $A \rightarrow A_3A_2A_1A_0$.

Using XOR gates.



Q8. Decimal | BCD | 9's complement

	ABCD	wxyz
0	0000	1001
1	0001	1000
2	0010	0111
3	0011	0100
4	0100	0101
5	0101	0100
6	0110	0011
7	0111	0010
8	1000	0001
9	1001	0000

$$y = B \oplus C$$

AB	00	01	11	10
CD	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	x	x	x	x
10	0	0	x	x

$$w = A'B'C'$$

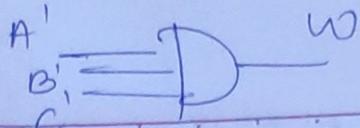
AB	CD	00	01	11	10
00	00	00	(1)	(1)	00
01	00	(1)	00	00	00
11	(1)	00	x x	x x	x x
10	00	x x	x x	x x	x x

AB	CD	00	01	11	10
00	00	1	0	0	0
01	01	0	0	0	0
11	11	0	0	x x	x x
10	10	0	0	x x	x x

$$x = Bc' + B'c$$

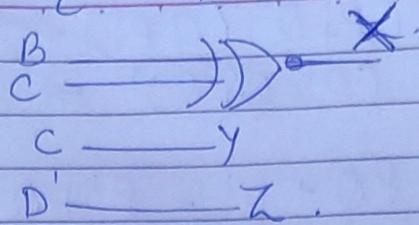
$$+ B \oplus C$$

$$Z = D'$$



~~CD 000 01.11.10~~

A10					
00		0	0		1
01	1	0	0		1
11	x	x	x		x
10	x	0	x		x



$$QP \cdot (17) = (00111)_2$$

$$10 \quad (111)_2$$

1111
1111
1111X
1111XX
1111X XX
11100001 ↗ E 16

$$Q10_{50} \text{ Switch } @ 1 \text{ pFMA} \Rightarrow D_0 = 0 \\ D_1 = 1$$

$$D_2 = 0.$$

$\therefore I_1 > \text{higher}$

$$20 \text{ Sujets } \Rightarrow D_0 = 1, D_2 = 1,$$

Switzen
@ 3 $\Rightarrow D_0 = 1, D_1 = 0$
 $D_2 = 1.$
 $\therefore I_S \rightarrow \text{higer}.$

Suiten $D_0 = 1$

$$\underline{D_2 = 1}$$

$\therefore 16$

— 1 —

— 1 —

e.

D61

~~D5~~
~~D6~~

$\rightarrow D \neq$

卷之三

1

→

Q91.

A handwritten musical diagram on five horizontal lines. The first line has a bracket labeled 'VCC' above it. The second line has a bracket labeled 'B₀' above it. The third line has a bracket labeled 'Do' above it. The fourth line has a bracket labeled 'D₁' above it. The fifth line has a bracket labeled 'D₂' above it. Below the lines, the text 'mall road, mausone.' is written. A bracket on the second line spans from the 'VCC' line to the 'D₁' line. A bracket on the fourth line spans from the 'B₀' line to the 'D₂' line. The fifth line is mostly blank. To the right of the diagram, the text 'decorate.' is written, with a bracket spanning from the 'D₁' line to the 'D₂' line.

$$Y_2 = D_S^* D_T = (P_S + D_T)^* = P^* + Q,$$

$$P_1 = P_0 P_2 = (P + Q)(Q + P) \rightarrow P' + Q'$$

$$P_2 = I_1 I_0' = (P' + Q)(PQ)' \approx P'$$

$$Y_1 = P_0 P_2 = PQ' + P' = P' + Q'$$

$$D_S = \frac{I_0' I_2}{I_3' I_2} = (P + Q)' P = PQ + P = P$$

$$D_T = I_3 I_2 = (P' + Q')P = PQ'$$

$$Y_2 = (D_S + D_T)^{-1} = (PQ + PQ')^{-1} = P'$$

$$\left\{ \begin{array}{l} Y_1 = P' + Q' \\ Y_2 = P' \end{array} \right\}$$