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04/22/22

Quiz 11

1) $0 \to 5 \to 7 \to 1$

- state encoding

A: 000

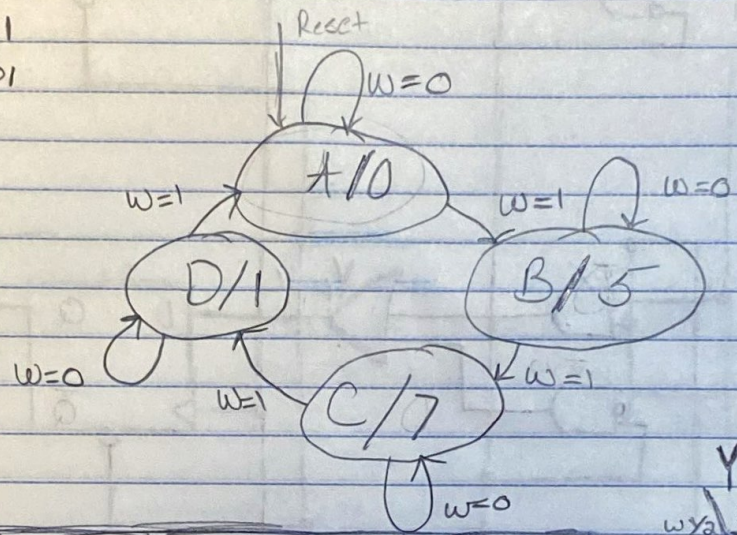
B: 101

C: 111

D: 001

- will need 3 flip flops because 3 bits
- synchronous

a)



b)

Present State $y_2 y_1 y_0$	Next state $w=0$ $Y_2 Y_1 Y_0$	Next state $w=1$ $Y_2 Y_1 Y_0$	Count $z_2 z_1 z_0$
000	000	101	000
101	101	111	101
111	111	001	111
001	001	000	001

Y_0

$w y_2$ \ $y_1 y_0$	00	01	11	10
00	0	1	d	d
01	d	1	1	d
11	d	1	1	d
10	1	0	d	d

Y_1

$w y_2$ \ $y_1 y_0$	00	01	11	10
00	0	0	d	d
01	d	0	1	d
11	d	1	0	d
10	0	0	d	d

Y_2

$w y_2$ \ $y_1 y_0$	00	01	11	10
00	0	0	d	d
01	d	1	1	d
11	d	1	0	d
10	1	0	d	d

$$Y_0 = \bar{w} y_0 + y_2 + w \bar{y}_2 \bar{y}_0$$

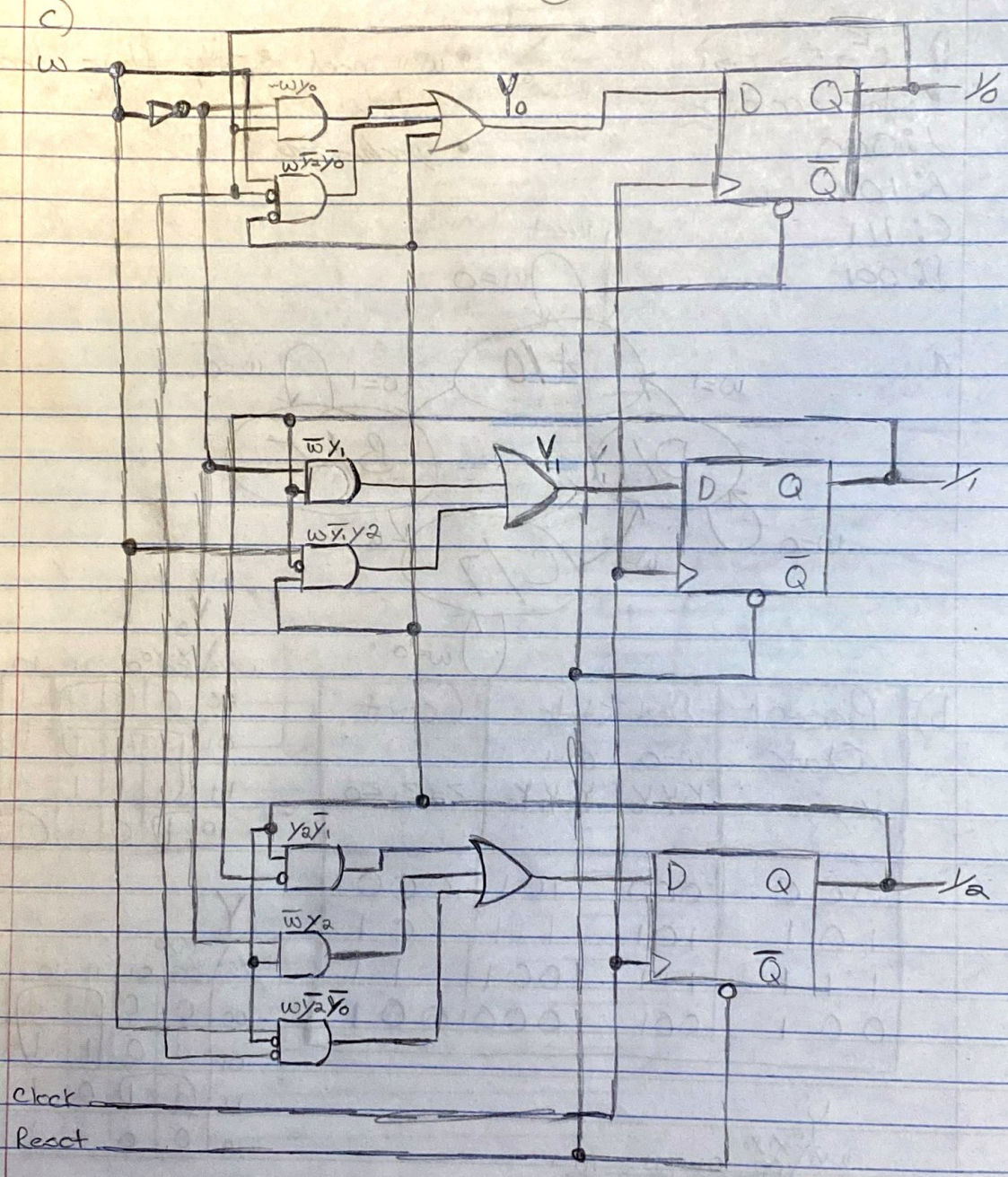
$$Y_1 = \bar{w} y_1 + w y_2 \bar{y}_1$$

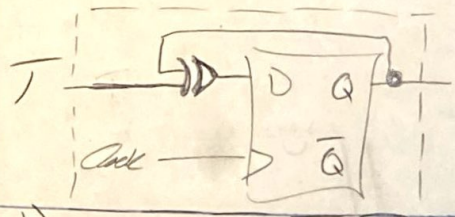
$$Y_2 = y_2 \bar{y}_1 + \bar{w} y_2 + w \bar{y}_2 \bar{y}_0$$

* also forgot the XOR simplification pattern

*should have been using $\bar{Q}$ to make it simpler

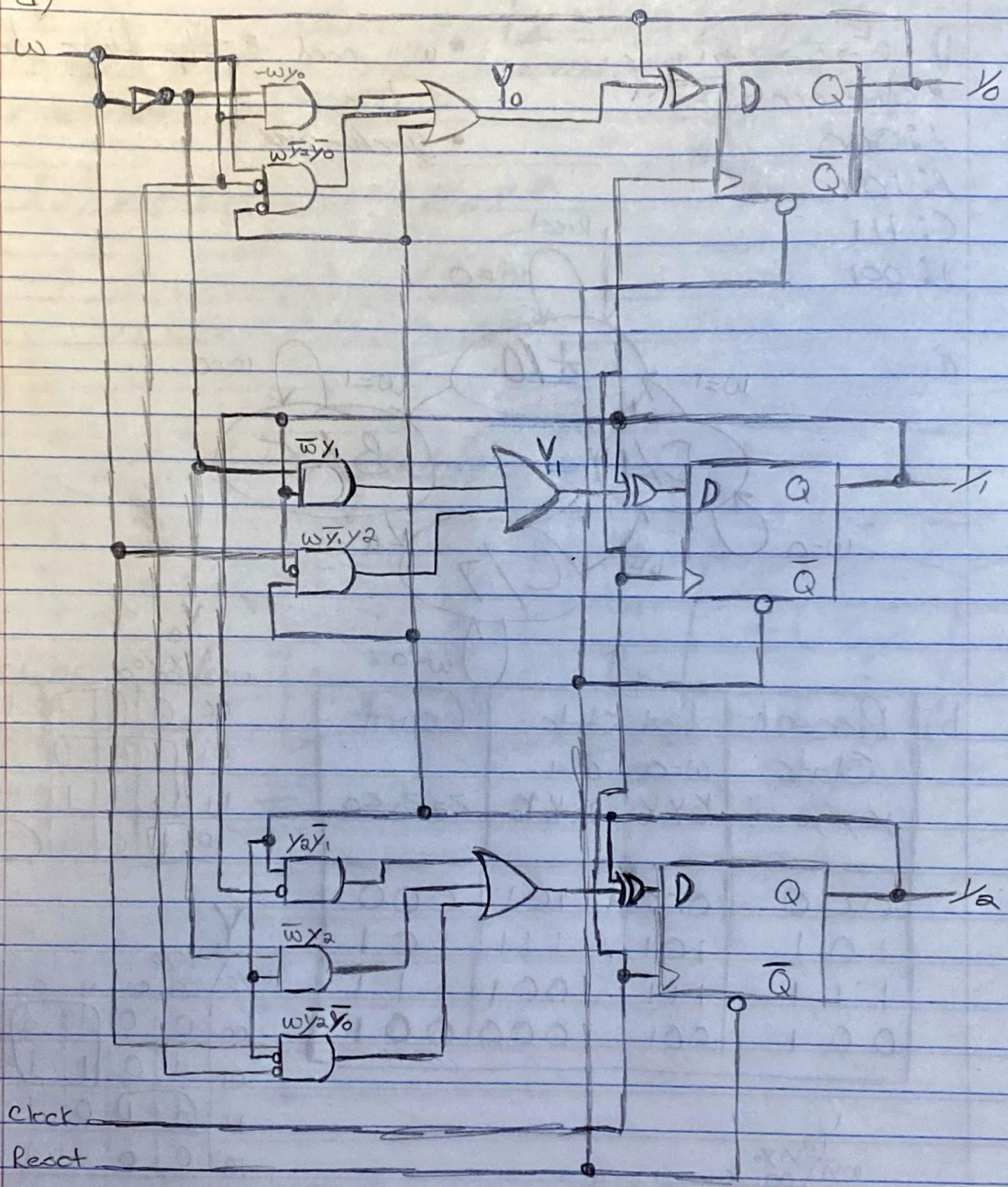
c)

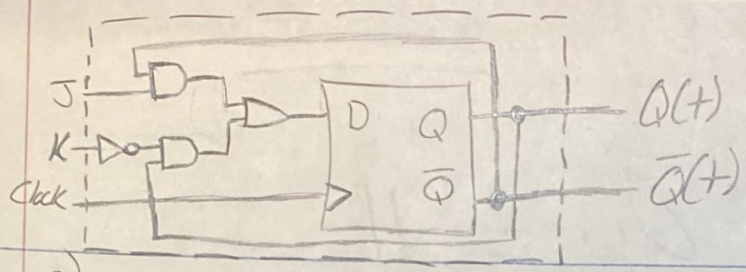



T
D
Q
Clock
Q̄

$= T\ f.f.$

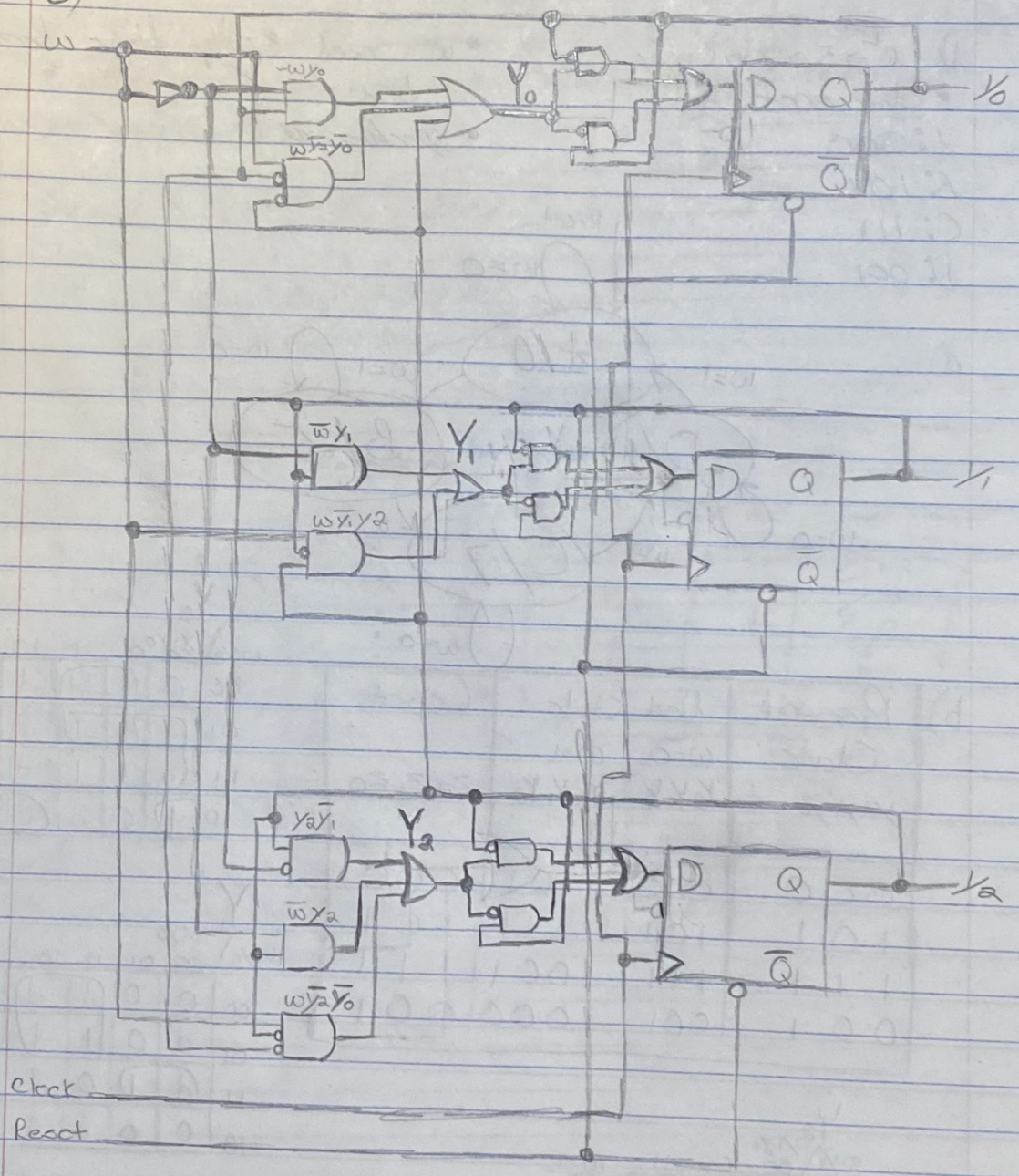
d)


w
$\bar{w}y_0$
Y_0
$w\bar{y}_2\bar{y}_0$
D
Q
Q̄
Y_0
$\bar{w}y_1$
Y_1
$wy_1\bar{y}_2$
D
Q
Q̄
Y_1
$y_2\bar{y}_1$
$\bar{w}y_2$
$w\bar{y}_2\bar{y}_0$
D
Q
Q̄
Y_2
Clock
Reset


J
K
Clock
D
Q
$\bar{Q}$
Q(t)
$\bar{Q}$(t)

= J.K. f.f.

c)


w
$\bar{w}y_0$
$w\bar{y}_2\bar{y}_0$
Y_0
D
Q
$\bar{Q}$
Y_0
$\bar{w}y_1$
$w\bar{y}_1y_2$
Y_1
Y_1
$y_2\bar{y}_1$
$\bar{w}y_2$
$w\bar{y}_2\bar{y}_0$
Y_2
Y_2
Clock
Reset

2)

a)
- $Z = y_1 + y_0$
- $Y_1 = \overline{y_0}$
- $Y_0 = w \oplus y_1$

b)

	Present State $y_1 y_0$	Next State $w=0$ $Y_1 Y_0$	Next State $w=1$ $Y_1 Y_0$	Output Z
A	0 0	1 0	1 1	0
B	0 1	0 0	0 1	1
C	1 0	1 1	1 0	1
D	1 1	0 1	0 0	1

c)