HW 10.15

P 14, 45d-f, 8, 51, 57, 18, 17, 20

old exam 1, 3

7 segments

HW 10.5 $DC \times BA = d_3 d_2 d_1 d_0$

only =1 for 3×3=9

$d_3 = D \cdot C \cdot B \cdot A$

DC \ BA	00	01	11	10
00	0	0	0	0
01	0	1	3	2
11	0	3	9	6
10	0	2	6	4

d_0	00	01	11	10
00	0	0	0	0
01	0	1	1	0
11	0	1	1	0
10	0	0	0	0

$d_0 = CA$

8

d_1	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	0	1	0	1
10	0	1	1	0

$d_1 = D\bar{B}A + D\bar{C}A + \bar{D}CB + CB\bar{A}$

$= DA\overline{BC} + CB\overline{DA}$

$= (DA) \oplus (BC)$

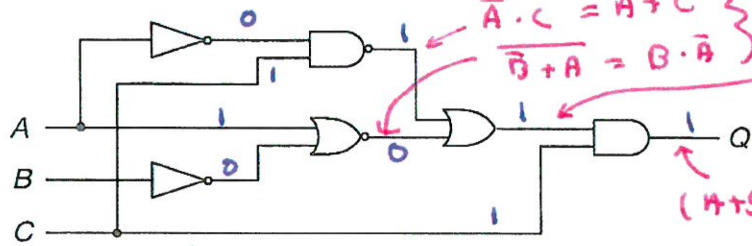
d_2	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	0	1
10	0	0	1	1

$d_2 = D\bar{C}B + DB\bar{A}$

$= DB(\bar{C} + \bar{A})$

$= DB\overline{AC}$

1. Consider the below mess of gates:



$\overline{\overline{A}\cdot C} = A+\overline{C}$
$\overline{\overline{B}+A} = B\cdot\overline{A}$
$A+\overline{C}+B\overline{A}$
$= A+B+\overline{C}$

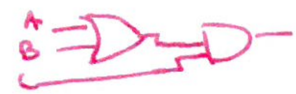
$(A+B+\overline{C})\cdot C = (A+B)C$

4

(a) Convert the mess of gates into the equivalent boolean expression.

(b) Use boolean algebra to reduce your boolean expression.

(c) Implement your reduced boolean expression in gates.



(d) On this sheet of paper, label the logic level of each wire for inputs: $(A, B, C) = (1, 1, 1)$.

2. Perform the following conversions: $32+4 = 100100$

(a) Convert the decimal number 36 to binary.

(b) Convert the decimal number 35 to octal. $\underbrace{100}_{4}\underbrace{011}_{3}$

(c) Convert the hexadecimal number 34 to binary. 00110100

(d) Convert the hexadecimal number 33 to decimal. $3\times16+3 = 51$

(e) Convert the BCD number 0011,0010 to decimal. 32

(f) Convert the BCD number 0011,0001 to binary. $31 = 11111$

3. Reduce the following expressions:

(a) $A + \overline{(A+\overline{B}\,\overline{C})\cdot(\overline{A}C+\overline{D})}$

under bar: $\underbrace{A\overline{A}}_{0}C + A\overline{D} + \overline{B}\,\overline{C}\,\underbrace{\overline{A}C}_{0} + \overline{B}\,\overline{C}\,\overline{D}$

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

now bar → $D + (\overline{A}\cdot(B+C))$

A+ A+B A+C

$= A+B+C+D$

(b) $\overline{AB+\overline{C}} + A\overline{C} + B$

$(\overline{A}+\overline{B})\cdot C$ B+C A+C

$= \overline{A}C + A+B+C = A+B+C$

~~(c) $ABC + \overline{A}B\overline{C} + A\overline{B}C + \overline{A}C + A$~~ $= A+B+C$

$A+B\overline{C}$ A+C B+C

6

median = 92
mean = 86
$\sigma = 10$

Segment A

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

$\bar{D}\bar{B}$ BD A C

Segment B

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

$\bar{C}\bar{D}$ $\bar{B}$ CD

Segment C

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

$\bar{C}$ D B

Segment D

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

$\bar{D}\bar{B}$ $B\bar{C}D$ A $\bar{B}C$ $C\bar{D}B$

Segment E

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

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

Segment F

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

$\bar{C}\bar{D}$ $B\bar{C}$ A $B\bar{D}$

Segment G

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

A $B\bar{C}$ $\bar{B}C$ $B\bar{D}$

P. 8, 14, 17, 18, 20, 45d-f, 51, 52

8 a) 0 b) 0 c) 0 d) AND e)

5

$= \frac{1}{R+1} \cdot 5V$

14 a) $\bar{A}\bar{B}C + \bar{A}BC + A\bar{B}\bar{C}$

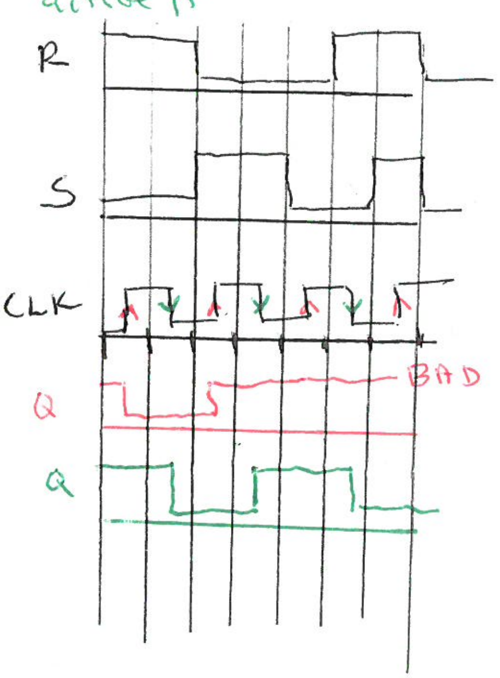
4 b) $\bar{T} = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}C + AB\bar{C} + ABC$

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

active H

17

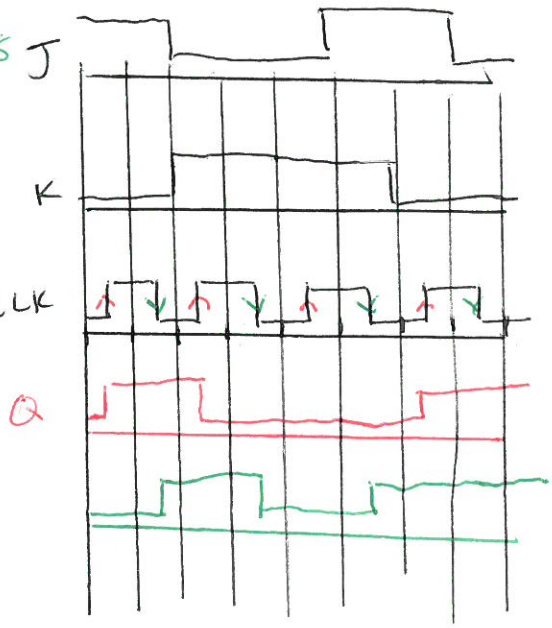
8



pos edge

neg edge

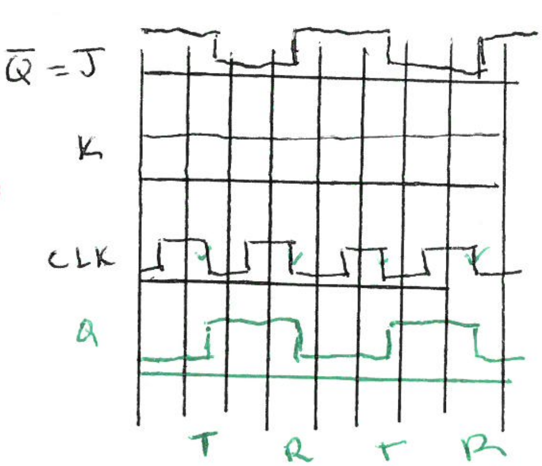
18

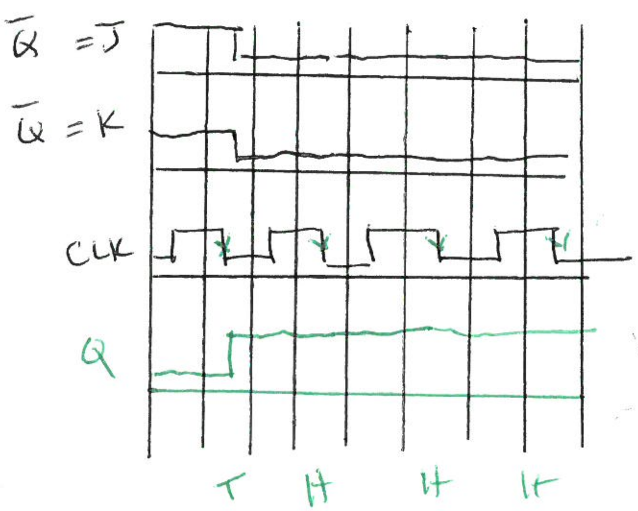


20 a) remains in JK=01 clear mode always — Q=0

Note: neg edge trig JKFF

6





45d-f $\overline{\bar{A}\cdot(\bar{A}+\bar{B})\cdot(A+\bar{B})} = \overline{\bar{A}\cdot\bar{B}} = A+B$

$\hookrightarrow 0+\bar{A}\,\bar{B}+\bar{B}A+\bar{B}\cdot\bar{B} = \bar{B}(A+\bar{A})+\bar{B} = \bar{B}$

6

$AB+\bar{A}\bar{B}+A\bar{B}+\bar{A}B = (A+\bar{A})B+\bar{B}(A+\bar{A}) = B+\bar{B} = 1$

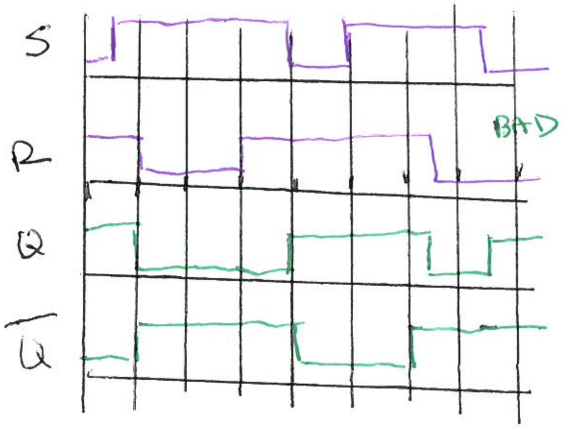
$\overline{\underbrace{(A+B)(A+C)}_{A+BC}+\underbrace{A(B+C)}_{AB+AC}} = \overline{A+BC} = \bar{A}\cdot(\bar{B}+\bar{C})$

$AB+AC = A+BC$

absorb

51 (active low SRFF)

5



52 (active high level trig SRFF)

5