Santiago [illegible]
12-15-20
CSC 28

Final Exam

1. F → T is a tautology?

F	T	F→T
T	T	T
T	F	F
F	T	T
F	F	T

False

2. Perdo ∈ D   Robust ∈ P

lower de computos   lower al [illegible]

False?

C(Perdo) ∧ O(Perdo, Robust)

∧ = or   ∧ = and

3. A + T = A

A or T = A   False

4. (p → q) → (¬q → ¬p) is a contradiction?

False

contradiction is proposition that is always false

p → Q   p → ¬q

		p	q	p→q	¬q→¬p	(p→q)→(¬q→¬p)
		T	T	T	T	T
T	F	T	F	F	F	T
F	T	F	T	T	T	T
T	T	F	F	T	T	T

5. $(p \to q) \vee p$ is a tautology?

p	q	$p \to q$	$(p \to q) \vee p$
T	T	T	T
T	F	F	T
F	T	T	T
F	F	T	T

$\vee = \text{or}$
$\wedge = \text{and}$

True

6. $(A' + B')' = BA$

$A' \cdot B'$

$A = 0$ or 1 $\quad B = 0$ or 1

So False

Boolean Algebra Law

7. $((A' + A)')' = 1$

$A' + A = 1$ True

8. $(A' \cdot B)' \cdot A' = A'B'$

~~AB~~

$A'A' \cdot BA'$

$A' \cdot BA'$ $\quad (A' \cdot B)' = A'B'$

$A + B$

$A' + A'B$

$(A')' = A'B'$

$A = A'B'$

False

2.27

a. $(A+B)\cdot A' = A'\cdot B$ ⋅ = and + = or

$AA' + BA' = A'\cdot B$

$0 + BA' = A'\cdot B$ **true**

$A'B = A'B$

10. $(B + (A + A')) = 1$

↓

$B + 1 = 1$ **true**

↓

$1 = 1$

* using regular expressions

11. $a^* a = a^+$ **true** ?

* = 0 or more

\+ = 1 or more

12. $(a^* + \lambda)ba = ba^+ + ba$ + = union = or = ∪

$(a^* + \lambda)ba = \{ba, aba, aaba, ...$

$ba^+ + ba = \{ba,$

false

13. $r = (0)^*(0+1)^*(11)^+$ on $\Sigma = \{0,1\}$

$L(r)$ includes: 0000111?

0000111 True

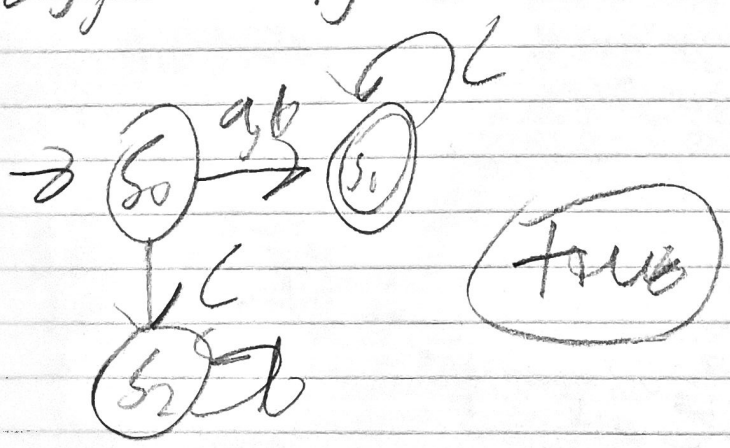
14. $L(r_1), r_1 = (a+b)^*$ with alphabet $\Sigma = \{a,b\}$

$L(r_2), r_2 = (c+d)^*$ with alphabet $\Sigma = \{c,d\}$ true because

$L(r_1) \cdot L(r_2)$ on alphabet $\Sigma = \{a,b,c,d\}$ equals a language that holds any string containing 0 or more occurrences of a or b or c or d.

True?

15. $L(r), r = (a+b)c^*$?



True

16. 2+(-2)

000010 → 111101 + 1 → 111110

~~100010~~

000010 → 2

+ 111101 → -2

00

1 111 1

111101 000010 → 2

+1 + 111110 → -2

111110 000000 (true)

17. 32.5

I expect it 2 is 5 (adds adds, 127 to 5)?

2|32

2|16 0

2|8 0

2|4 0

2|2 0

2|1 0

2|0 1

5

00100000

1.00000 × 2^5

(true)

16. 2+(-2)

000010 → 111101 (+1)

~~1000010~~ 00

000010 → 2
\+ 111101 → -2

111101
\+1
111110

000010 → 2
\+ 111110 → -2
~~1~~000000

true

17. 32.5

~~the~~ exponent of 2 is 5 then adding 127 to 5??

2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
2	1	0
2	0	1

00100000

[1] 00100000

1.00000 × 2^5

true

18. 1.5   0 00000 0010   2.5×2 = 1.0 | 1

2|1 | 0   [ ] 0000000 1   0×2 = 0.0 | 0

2|0 | 1   0×2 = 0.0 | 0

II] 10 ×2^1   False ?

III]

19. False

20. 0001 → 1110 by 2's complement?

0001

1000

↓

1110 → 1111   False

21. Represents x'?

	y'	y
x'	0	0
x	1	1

→ x   False

22. 6 by 110 represented by xy'z?

x	y	z	D
0	0	0	
0	0	1	
		0	
		1	

Cont'd

22. (c+H.)

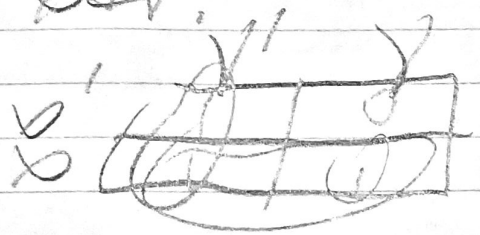
x	y	z	f
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

$x'y'z'$ [Color]

	$y'z'$	$y'z$	yz	yz'
x'	0	1	3	2
x	4	5	7	6

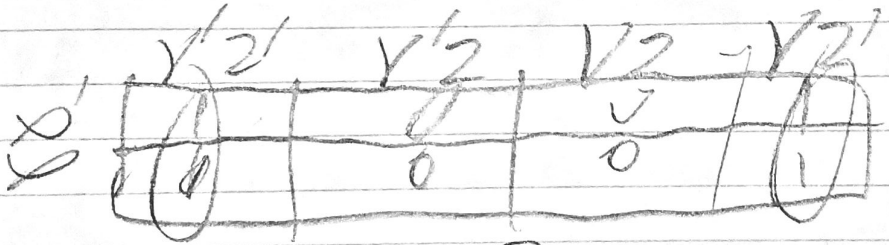
(1)

23. $x \oplus y$



$y' + xy$ [Green]

24.



(z') [Color]

26. 1.75 0000010

2 | 1 90
2 | 0 1

I] 0000010

II] 1.0×2^1 → 127+1=128

2

10000000

.75 x2 = 1.50
.50 x2 = 1.0
.0 x2 = 0.0 0

10 | 100

III]

AB^1

0

7. $(A+B)A^1$

$A'A + BA'$

$0 \quad BA'$

$(AB + AB')$

$A(B+B')$

$A \cdot 1$

$A \cdot 12A$

29. a) $\overset{T}{p} \to \overset{T}{q}$ p: If sun orbits Earth
q: Moon is made of cheese

$\neg p$ F $\to \neg q$ Contrapositive

$\therefore \neg q$ F

b) [Invalid] If you can make conclusion false and premises true, it is invalid.

30. $p \to q$

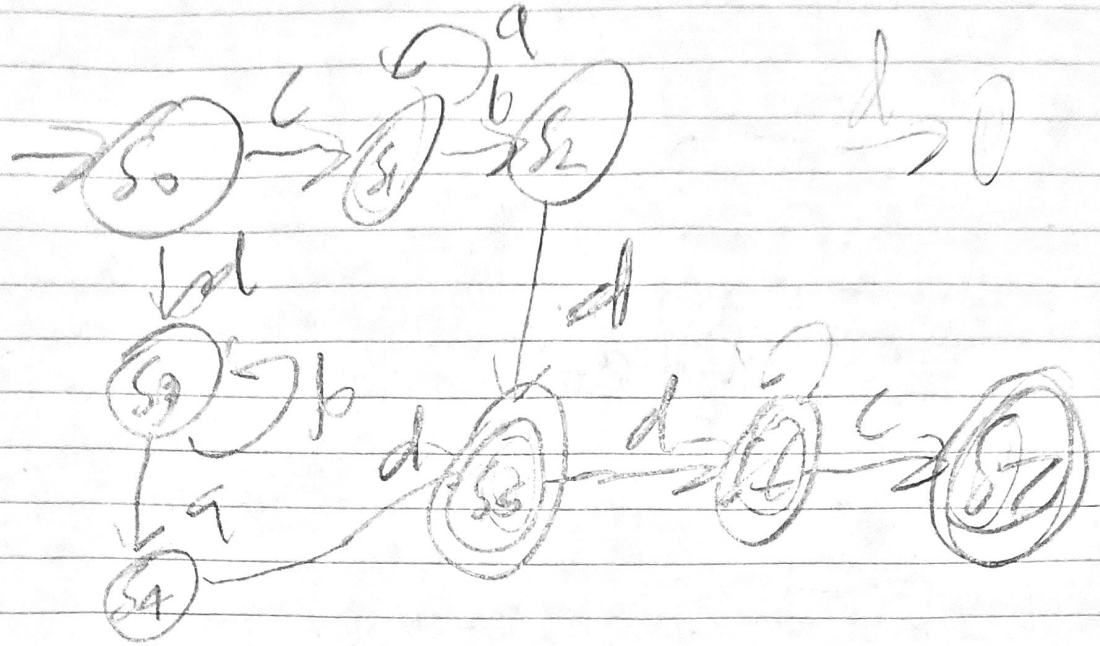
$\therefore \neg q \to \neg p$

p: Sun orbits Earth
q: Moon made of cheese

$p \to q \equiv \neg q \to \neg p$ $p \to q \equiv \neg p \vee q$

D. $\neg q \to \neg p \equiv q \vee \neg p$
$\equiv \neg(\neg q \wedge p)$
$\equiv \neg(p \wedge \neg q)$
$\equiv \neg p \vee \neg\neg q$
$\equiv \neg p \vee q$
$\equiv p \to q$

3D. r = (ca* b + dd b*) d + dc over alphabet {a, b, c, d}



Accepted
L(r) = {b, ...}

L(r) = {cab, ddc, ...} d + dc

Not accepted
L(r) = {c ...}
L(r) = {b ...}

31. $P(n) = 2^0 + 2^1 + \dots + 2^n = 2^{n+1} - 1$

A) Base case: $P(1) = 2^0 + 2^1 + 2^2 \quad 2^{1+1} - 1$

$1+2 \quad = 2^2 - 1$

$3 \quad = 3$

Inductive [illegible]: Use assume that

$P(k)$ is true

Inductive step:

So we show that $P(k+1)$ is true as well

$P(k) = 2^{k+1} - 1$

b) $P(k+1) = 2^{k+1+1} - 1 = 2^{k+2} - 1$

$P(k+1) = 1 + P(k) + (k+1)$

$= 1 + 2(2^{k+1} - 1) - 1$

$= 1 + 2(2^{k+1} - 1)$

$= k + 2 \cdot 2^{k+1} - 2$

$= 2^{k+2} - 1$ QED

32. $(AB'(FB+E)+B'A')'$

$AB'(FB)'+AB'(E)'+B'A'$

$B'(A(FB)'+A(E)'+A')$

$B'(A(FB+E)'+A')$

$B'(A'+(FB+E))$

$B'(A'+E)$