hw Quiz

67 + 14 = 81 xxxxx 92

Name: Sylvia Le

Course: COM219

Homework 4

Question 1

Let memory access time = t, h_i = hit ratio

Cache L2 access time = 0.2 t

Cache L1 access time = 0.1t

During memory reference, L1 is searched, if fail the L2 is searched. If both L1 and L2 fail then main memory will be searched

Average access time will include success in cache L1, failure in L1 but success in L2, failure in L1 and 2 but success in memory

Average access time = $h_1 \times 0.1t + (1 - h_1) \times h_2 \times 0.2t + (1 - h_1)(1 - h_2) \times 1 \times t$

$= 0.8 \times 0.1t + 0.2 \times 0.9 \times 0.2t + 0.2 \times 0.1 \times 1 \times t$

$= 0.136t$ Mis Calculated

10/20

Sylvia, you are using a different formula. Tc=c+(1-h)m
17/20

Ratio of main memory access time to system of two cache memory = t/0.136t = 7.35

The memory access time is about 7.35 times slower without the cache system described above

Question 2

Type	Total effective disk size	Per TB cost of usable (effective) data storage	Fault tolerance
RAID 0	Data is distributed over every drives Effective disk size = 12x8 = 96 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/96 = $12.5	Data is distributed Can't lose any disk Fault tolerance = 0
RAID 1	Exact copy on all drives Effective disk size = 8 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/8 = $150	Every drive keep the same copies

			Can lose up to 11 drives Fault tolerance = 11
RAID 1+0	Two groups of RAID 1 that together make up RAID 0 Each RAID 1 group has 12/2 = 6 drives Each RAID 1 group capacity = 8 TB (as explained above) Effective disk size = 8 + 8 = 16 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/16 = $75	Every drive in RAID 1 keep the same copies Each child can lose up to 6-1 = 5 drives Fault tolerance = 5x2 = 10
RAID 100	Two groups of RAID 1+0 that together make up RAID 0 Each RAID 1+0 group has 12/2 = 6 drives Each RAID 1 group has 6/2 = 3 drives Each RAID 1 group capacity = 8 TB (as explained above) Each RAID 1+0 group capacity = 8 + 8 = 16 TB Effective disk size: 16+16 = 32 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/32 = $37.5	Every drive in RAID 1 keep the same copies Each child can lose up to 3-1 = 2 drives Fault tolerance = 2x2 = 4
RAID 5	Data is distributed but one drive is used for parity Effective disk size: (12-1)x8 = 88 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/88 = $13.63	One drive added for parity, but parity is distributed Fault tolerance = 1
RAID 6	Data is distributed but two drive is used for parity Effective disk size: (12-2)x8 = 80 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/80 = $15	Two drive added for parity, but parity is distributed Each child ault tolerance = 2 (the

			course note)
RAID 6+0	Two groups of RAID 6 that together make up RAID 0 Each RAID 6 group has 12/2 = 6 drives Each RAID 6 group capacity = (6-2)x8 = 32 TB (two drives for parity) Effective disk size = 32 + 32 = 64 TB	Cost of 12 drives = 100 x 12 = $1200 Per TB cost = 1200/64 = $18.75	Each RAID 6 group has fault tolerance = 2 (the course note) Fault tolerance = 2

18/20

Question 3

Truth table:

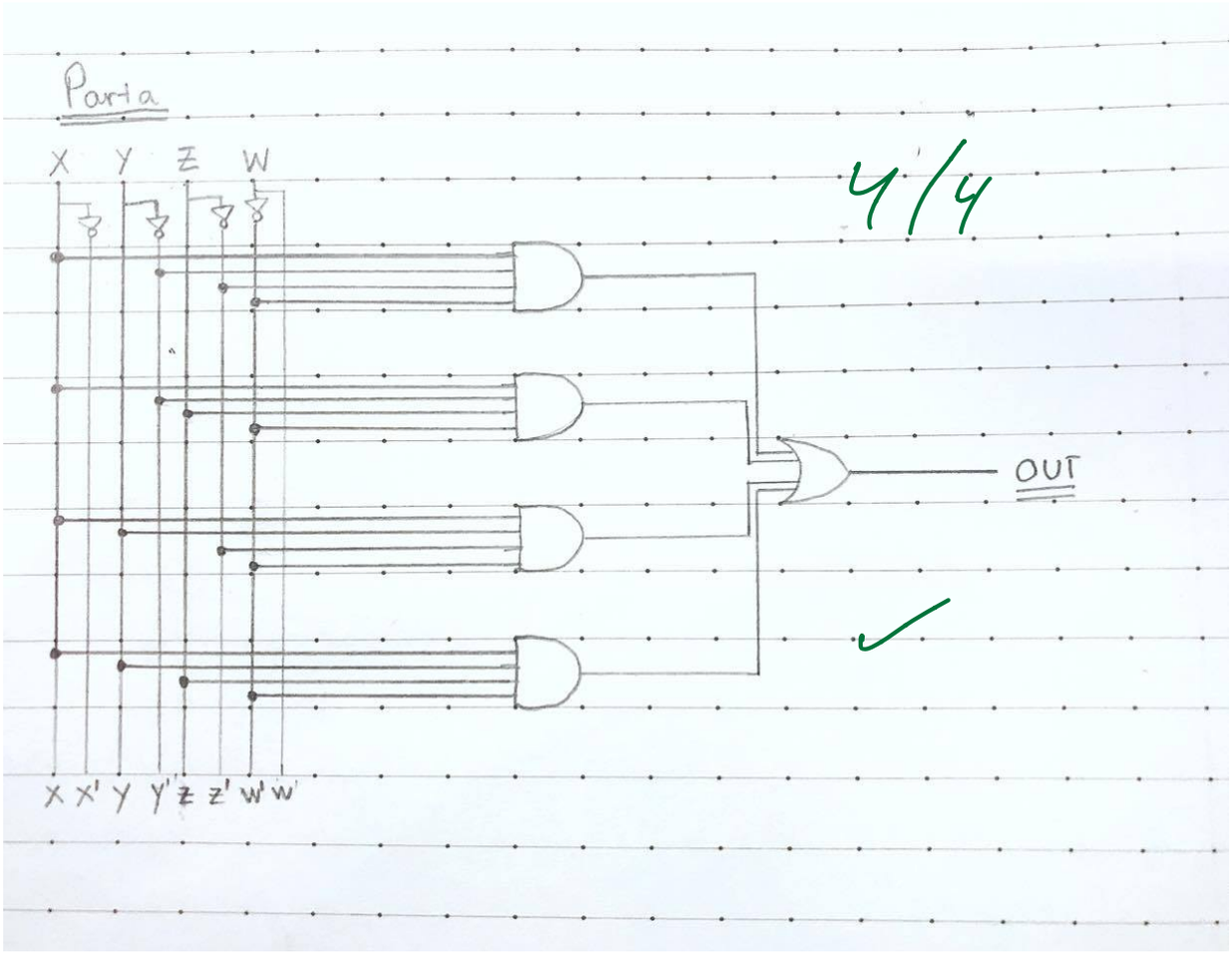
x	y	z	w	Out
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

8/8 ✓

a) The Boolean expression: consider the rows that has the output 1 (in red)

f = xy'z'w' + xy'zw' + xyz'w' + xyzw' ✓

b) The circuit for part (a): 4/4



c) Simplification of part (a) **f**

f = xy'z'w' + xy'zw' + xyz'w' + xyzw'

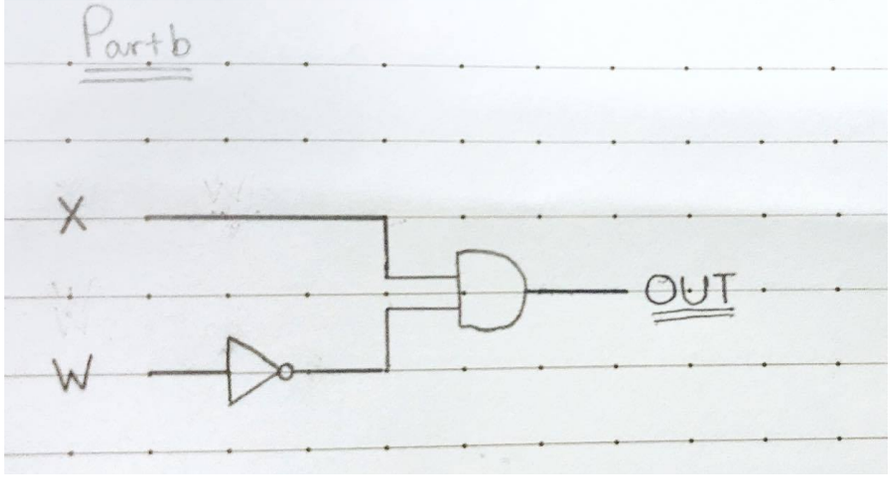
= xw' (y'z' + yz + y'z + yz') //distributive law

= xw' [y'(z' + z) + y(z' + z)] //distributive

= xw'[y' + y] //inverse law, identity law

= xw' ✓ //identity law

6/6



Question 4

i) Truth tables

- For part a: **f** = xy'z + xyz' + x'y' + xz'. Rows with output = 1 are

  + Rows that has the value of x, y, z of 101 or 110

  + Rows that has the value of x, y, z of 00* or 1*0 (* means it can be either value)

x	y	z	Out	Check
0	0	0	1	1
0	0	1	1	1
0	1	0	0	0
0	1	1	0	0
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	0	0

4/4

- For part b: **f** = x'yz + y'z'w + x' (y'z' +y'zw') + y'zw = x'yz + y'z'w + x'y'z' + x'y'zw' + y'zw

  Rows with output = 1 are:

  + Rows that has the value of x, y, z, w of 0010

  + Rows that has the value of x, y, z, w of 011*, *001, 000*, *011

x	y	z	w	Out	Check
0	0	0	0	1	1
0	0	0	1	1	1
0	0	1	0	1	1
0	0	1	1	1	1
0	1	0	0	0	0
0	1	0	1	0	0
0	1	1	0	1	1
0	1	1	1	1	1
1	0	0	0	0	0
1	0	0	1	1	1
1	0	1	0	0	0
1	0	1	1	1	1
1	1	0	0	0	0
1	1	0	1	0	0
1	1	1	0	0	0

2/4

Correct but watch the order

4/4/

1	1	1	1	0	0

ii) Simplification:

- For part a:

f = xy'z + xyz' + x'y' + xz'

= (xyz' + xz') + (xy'z + x'y') //commutative law

= [z'(x+xy)] + [y'(xz+x')] //distributive law this law first

= (z'x) + [y'(x'+z)] //absorption law (1st part), distributive law (2nd part)

= xz' + [y'(x'+z)] //inverse law, identity law

= xz' + x'y' + y'z //distributive law

3/6

correct but no minimal 5/6

- For part b:

f = x'yz + y'z'w + x' (y'z' +y'zw') + y'zw

= x'yz + y'w(z+z') + x'y'(z'+zw') //commutative law, distributive law

= x'yz + y'w + x'y'(z+z')(z'+w') //inverse + identity law, distributive law

= x'yz + y'w + x'y'z' + x'y'w' //identity law, distributive law

= (y'w + x'y'w') + x'yz + x'y'z' //commutative law

= y'(w + x'w') + x'yz + x'y'z' //distributive law

= y'(w + w')(w + x') + x'yz + x'y'z' //distributive law

= y'w + y'x' + x'yz + x'y'z' //identity law, distributive law

= (x'y' + x'yz) + y'w + x'y'z' //commutative law

= x'(y' + yz) + y'w + x'y'z' //distributive law

= x'y' + x'z + y'w + x'y'z' //(shortcut) distributive x 2, identity

= (x'z + x'y'z') + x'y' + y'w //commutative

= x'(z + y'z') + x'y' + y'w //distributive

= x'z + x'y' + x'y' + y'w //(shortcut) distributive x 2, identity

= x'z + x'y' + y'w //indempotent law

8/8

iii) Check: The column title **Check** above is added for this part

- For part a: rows with out put = 0 are rows that have value of x, y, x of 1*0, 00* and *01
- For part b: rows with out put = 0 are rows that have value of x, y, x, w of 0*1*, 00**, *0*1