

## NATIONAL UNIVERSITY OF SINGAPORE

## CS2100 – COMPUTER ORGANISATION

(Semester 2: AY2018/19)

## ANSWER BOOKLET

Time Allowed: 2 Hours

**INSTRUCTIONS TO CANDIDATES**

1. This answer booklet consists of **SIX (6)** printed pages.
2. Fill in your Student Number **with a pen clearly** below. Do **NOT** write your name.
3. You may write your answers in pencil (2B or above).

**STUDENT NUMBER**  
(fill in with a **pen**):

<b>A</b>	<b>0</b>							
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For examiner's use only		
<b><i>Question</i></b>	<b><i>Total</i></b>	<b><i>Marks</i></b>
Q1	12	
Q2	4	
Q3	14	
Q4	16	
Q5	22	
Q6	18	
Q7	14	
<b><i>Total</i></b>	<b>100</b>	

Write your answers in the box/space provided.

1a.  
[2]

**\$t0 =**  
**\$t1 =**

1b.  
[2]

1c.  
[2]

1d.  
[2]

1e.  
[2]

1f.  
[2]

Q1:

/12

2.  
[4]

Q2:

/4

3a.  
[2]

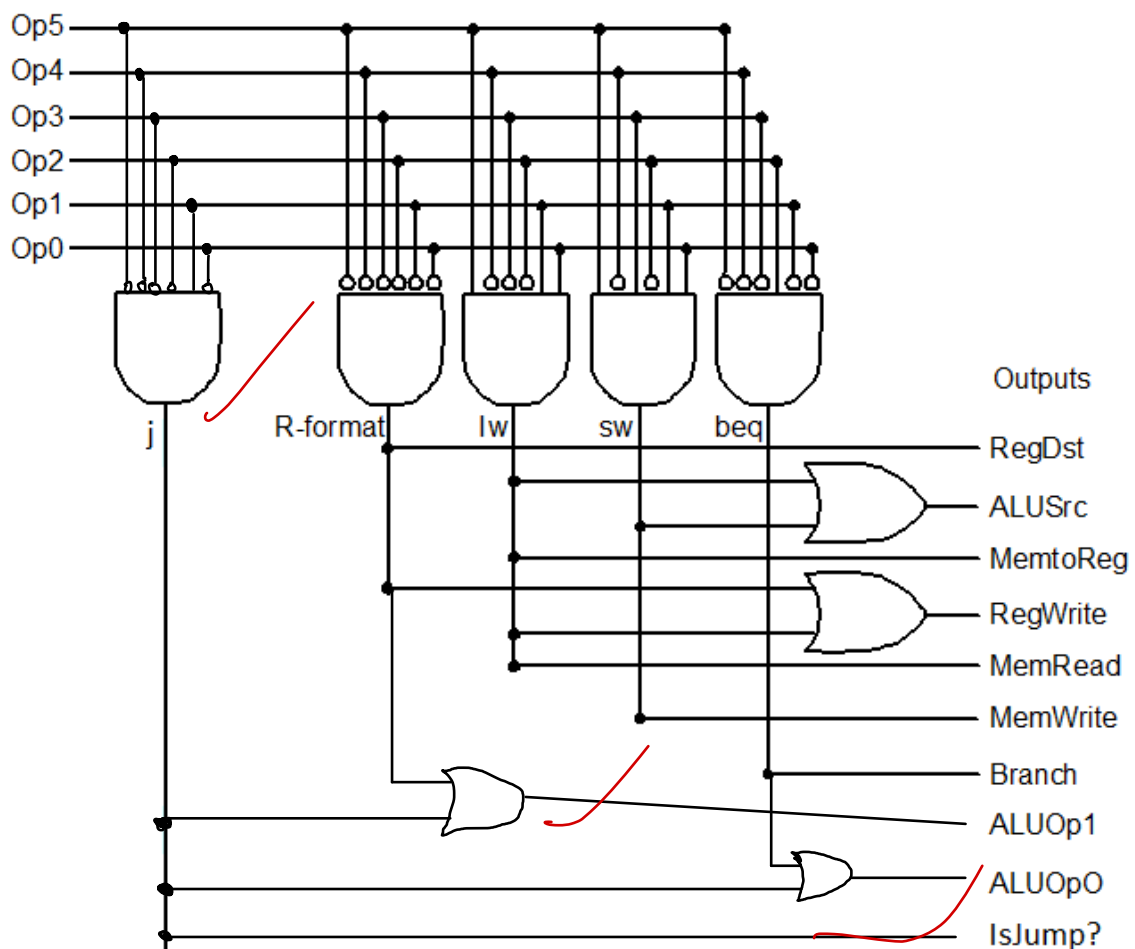
3b.  
[3]

3c. [3]

	RegDst	ALUSrc	MtoR	Reg Write	Mem Read	Mem Write	Branch	IsJump?	ALUOp	
									Op1	Op0
<b>R-type</b>	1	0	0	1	0	0	0	0	1	0
<b>lw</b>	0	1	1	1	1	0	0	0	0	0
<b>sw</b>	X	1	X	0	0	1	0	0	0	0
<b>beq</b>	X	0	X	0	0	0	1	0	0	1
<b>j</b>	X	X	X	0	0	0	0	1	1	1

3d. [4]

Inputs



3e.  
[2]

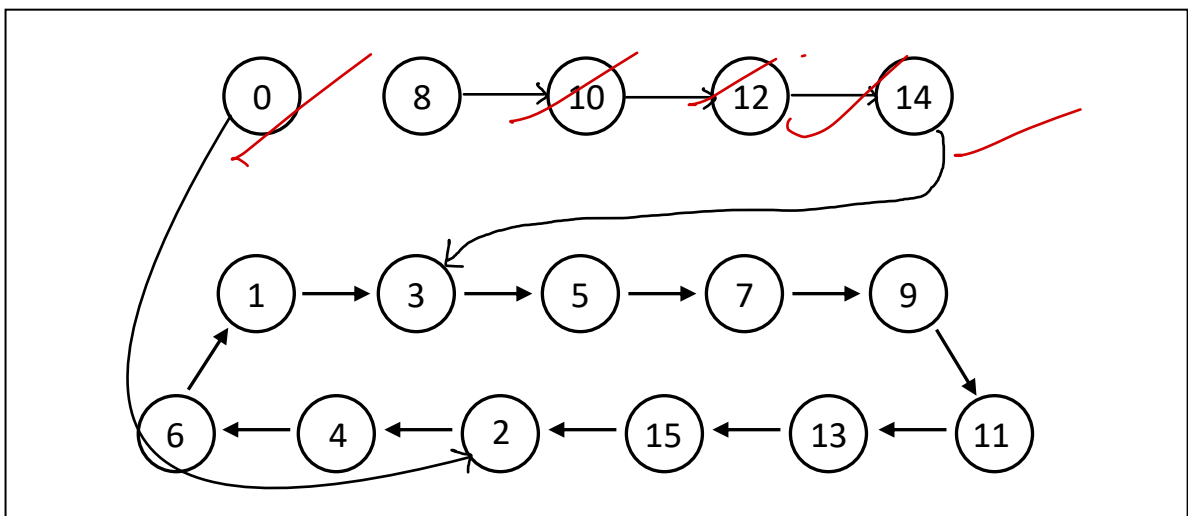
Q3:

/14

4a.  
[10]

 $DA =$  $TB =$  $TC =$  $JD =$  $KD =$ 

4b.  
[5]



4c.  
[1]

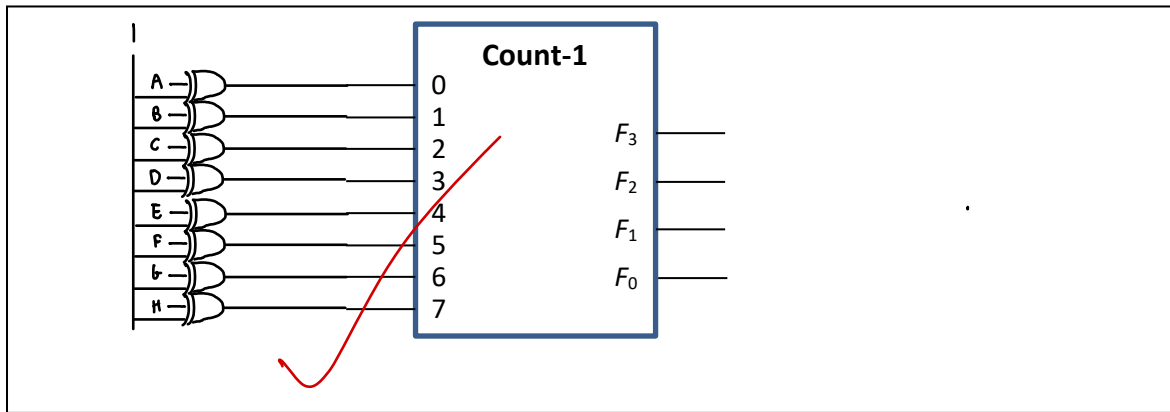
Is the circuit self-correcting? Why?

Q4:

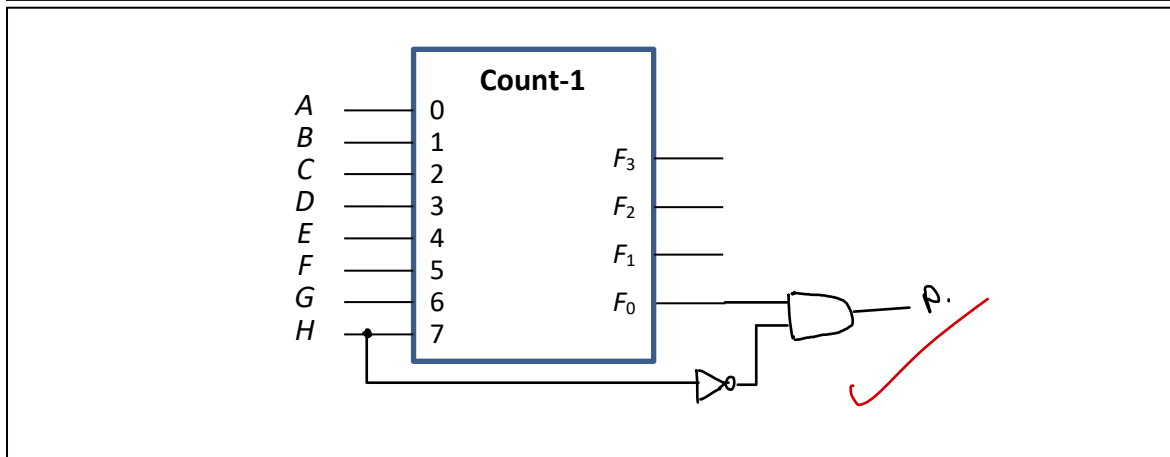
/16

a	b	XOR
0	0	0
0	1	1
1	0	1
1	1	0

5a.  
[3]



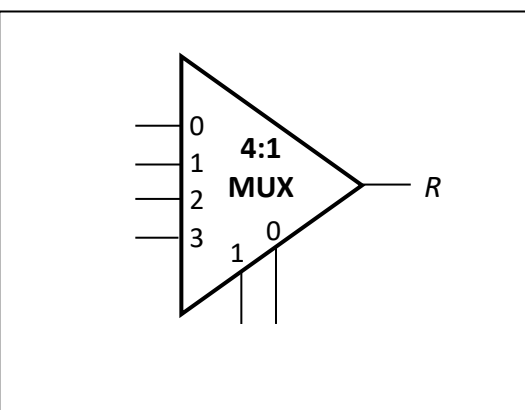
5b.  
[3]



5c.  
[4]



5d.  
[6]



5e.  
[6]

$X =$

$Y =$

$Z =$

Q5:

/22

6a. [2] Set index: \_\_\_\_\_ bits; Offset: \_\_\_\_\_ bits

6b. [3]  $A[0] \rightarrow \text{Set } \underline{\hspace{1cm}};$   $B[60] \rightarrow \text{Set } \underline{\hspace{1cm}};$   $C[1032] \rightarrow \text{Set } \underline{\hspace{1cm}}$

6c. [6] Hit rate for array A: \_\_\_\_\_; array B: \_\_\_\_\_; array C: \_\_\_\_\_

6d. [2] Number of misses in first iteration: \_\_\_\_\_

6e. [2] Number of misses in second iteration: \_\_\_\_\_

6f. [3] Total number of misses: \_\_\_\_\_

Q6:   /18

7a. [2]

7b. [3] Without forwarding/branch decision at MEM stage  
\_\_\_\_\_ cycles

7c. [3] With forwarding/early branching/no branch prediction  
\_\_\_\_\_ cycles

7d. [3] With forwarding/early branching/branch predicted not taken  
\_\_\_\_\_ cycles

7e. [3]

Q7:   /14

=== END OF PAPER ===