Problem 1:  The code fragment below runs on the illustrated implementation. Assume the branch is always taken.

(a) Show a pipeline execution diagram covering execution to the beginning of the third iteration of the loop.

(b) What is the CPI for a large number of iterations?

*Hint: Pay close attention to dependencies and carefully add the stalls to handle them; also pay close attention to the timing of the branch. Work from the illustrated implementation, do not adapt the solution from a similar past assignment, that would be like preparing for a 10 km run by driving around the jogging trail.*

```
LOOP:
lw $s0, 0($s1)
addi $s3, $s0, 4
bneq $s3, $0 LOOP
add $s1, $s1, $s2
xor $t0, $t1, $t2
or $t3, $t4, $t5
and $t6, $t7, $t8
```
Problem 2: The code fragment below (the same as the one above) runs on the illustrated implementation (different than the one above—and better!). Assume the branch is always taken.

(a) Show a pipeline execution diagram covering execution to the beginning of the third iteration of the loop.

(b) What is the CPI for a large number of iterations?

(c) An A points to a wire on the illustration. On the pipeline execution diagram show the value of that wire in every cycle that the corresponding stage holds a “live” instruction.

(d) A B points to a wire on the illustration. On the pipeline execution diagram add a row labeled B, and on it place an X in a cycle if the value on the wire can be changed without changing the way the program executes.

```
LOOP:
lw $s0, 0($s1)
addi $s3, $s0, 4
bneq $s3, $0 LOOP
add $s1, $s1, $s2
xor $t0, $t1, $t2
or $t3, $t4, $t5
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```