Name: ID

Quiz 9 key

a) What is the machine code **(in HEX)** of the blez instruction in the following code:

```
Test: addi  $2 $0  5
      syscall
       add  $9 $9 $2
      addi  $6 $6  4
      lw   $16  ($6)
      blez  $16   Test
```

Given that the blez opcode is 6.

The immediate is the offset which is -6 (in 16 bits binary: Binary 1111 1111 1111 1010)

000110 10000 00000 1111 1111 1111 1010

0x1A00FFFA

b) What is the machine code for: L1: j L2, given that the opcode is 2 and L1, L2 addresses are 0x2023078C , 0x20003204

Write L2 in Binary: 0010 0000 0000 0000 0011 0010 0000 0100

Then remove the 2 from right and 4 from left to get your 26 bits to use in the machine code.

The 26 bits are:

0000 0000 0000 0011 0010 0000 01

Add to the left yjr 6 bits op code:

000010 0000 0000 0000 0011 0010 0000 01

Organize by 4 bits (to get the HEX)

0000 1000 0000 0000 0000 1100 1000 0001

0x08000C81

a)The following questions are related to the register file:

- If the output ports are implemented using decoders and tri-state buffers:
  - What is the required decoder size? 5×32
  - How many decoders are needed? 2
  - How many **total** tri-state buffers are required? 64
- If the output ports are implemented using multiplexers:
  - How many multiplexers are required? 2
  - What is the size (input vs. output configuration) of each multiplexer? 32×1

b) If another processor (not related to the above one) has the following truth table for 3 of its control signals (namely: CS1, CS2, CS3). Sketch a complete circuit that can generate the three control signals.

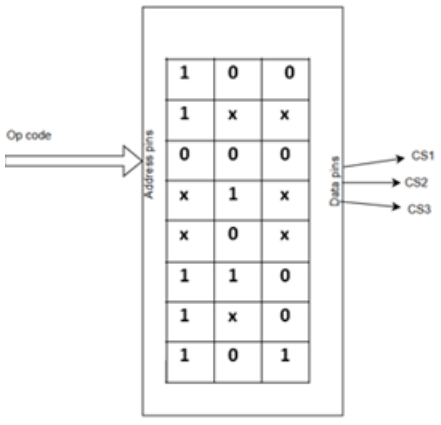
Op code In decimal	CS1	CS2	CS3
0	1	0	0
1	1	x	x
2	0	0	0
3	x	1	x
4	x	0	x
5	1	1	0
6	1	x	0
7	1	0	1

One Solution: use ROM of min size of 8x3

Store the Truth table in the ROM

Connect the op code to the address pins

The control signal are connected to the data pins



Another Solution: use 3x8 decoder

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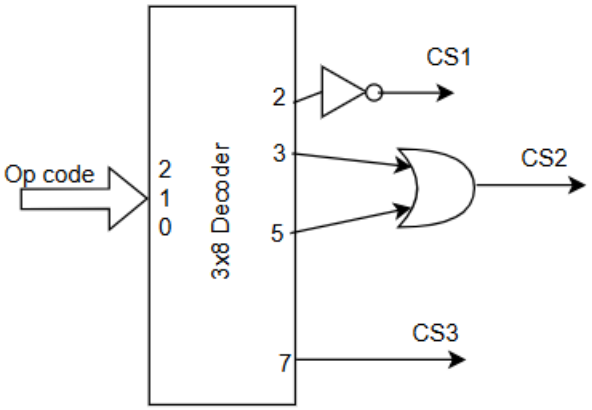

c) For a MIPS single cycle circuit discussed in the class, it is executing the following instruction:

lw $16 20($24) which has the following machine code: 0x8F100014.

Assume that every register has a value = its number x 1000 (For example, register 16 has 16000).

Also assume that the data memory is filled with all 1s (every byte of the memory =0xFF)

Answer the following questions:

- What is the value coming out of BUSA : 2400
- What is the value coming of BUSB: 1600
- What is the output of the extender 20
- What is the output of the ALU 2420
- What is the value of RW 16
- What is the value of BUSW -1