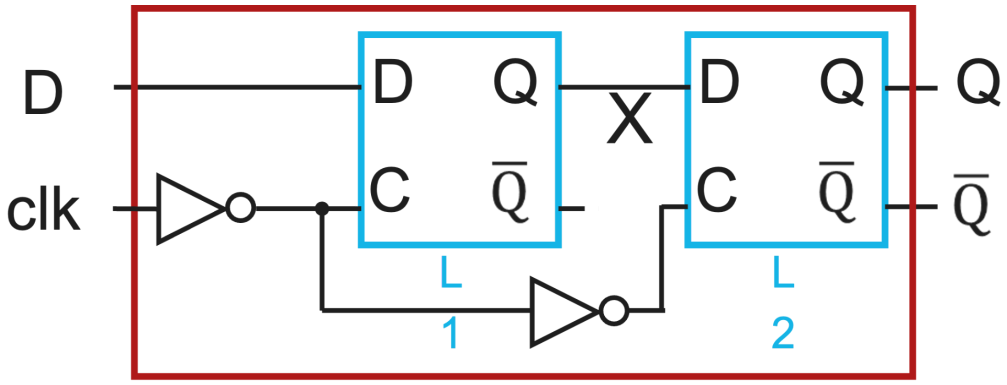
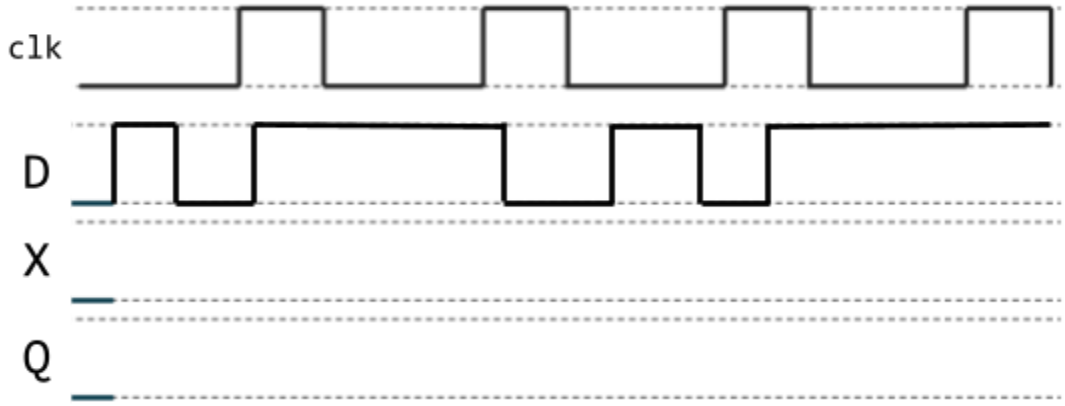
CS 3410 Fall 2025

Lab 5 Worksheet

1. D Flip-Flop Waveform

Complete the following waveform diagram for a positive edge triggered D flip-flop.





2. CPU Stages

a. Fill in the table below based on your knowledge of instructions and CPU stages (add has been done for you as an example)

	add	xori	sra	beq	sw	ld
FETCH	✓					
DECODE	✓					
EXECUTE	✓					
MEMORY						
WRITEBACK	✓					

b. Fill in the table below specifying which stage does the CPU read/write (**Memory** has been done for you as an example)

	READ FROM REGISTER	WRITE TO REGISTER	READ FROM MEMORY	WRITE TO MEMORY	NONE
FETCH					
DECODE					
EXECUTE					
MEMORY			✓	✓	
WRITEBACK					

3. Decoding and Encoding

a. Given these binary strings, decode them into RISC-V assembly

```
000001000000 | 00100 | 000 | 00011 | 0010011
```

```
0000000 | 00111 | 00000 | 010 | 00100 | 0100011
```

b. Given these lines of RISC-V assembly code, encode them into binary strings.

```
lui x5, 24
```

```
beq x8, x9, -16
```