Midterm Exam S2
Computer Architecture

Duration: 1 hr 30 min

Answer on the answer sheet <u>only</u>.
Do not show any calculation unless you are explicitly asked.
Do not use a pencil or red ink.
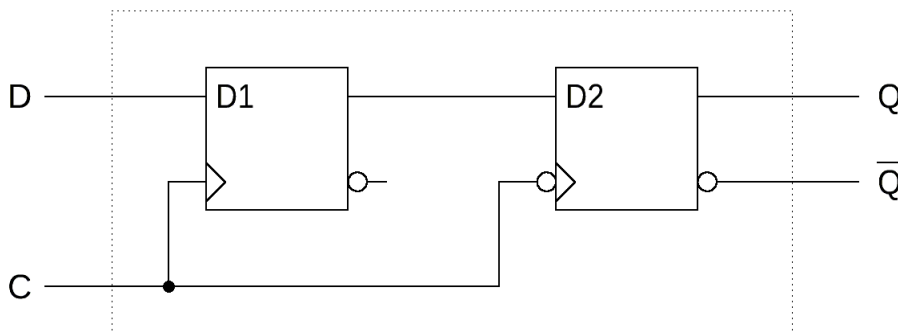
Exercise 1 (9 points)

1. Convert the numbers given on the <u>answer sheet</u> into their **single-precision** IEEE-754 representations. Write down the final result in its **binary form** and specify the three fields.
2. Convert the **double-precision** IEEE-754 words given on the <u>answer sheet</u> into their associated representations. If a representation is a number, use the base-10 following form: $k \times 2^n$ where k and n are integers (either positive or negative).

Answer the following questions for normalized numbers only and give the result in a power-of-two form.

3. For the single precision, what is the smallest number (greater than 0) which, when added to 16, gives a different result from 16?
4. For the double precision, what is the smallest number (greater than 0) which, when added to 2^{83}, gives a different result from 2^{83}?
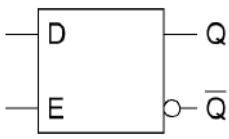
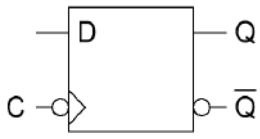## Exercise 2 (3 points)

Let us consider the following circuit:

1. Complete the timing diagrams shown on the <u>answer sheet</u> (up to the last vertical dotted line).
2. If we consider the whole circuit as only one D flip-flop, what type of flip-flop is it?
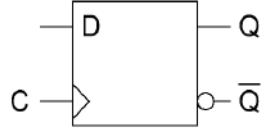
Exercise 3 (2 points)

Give the type of each flip-flop below (answer on the <u>answer sheet</u>).
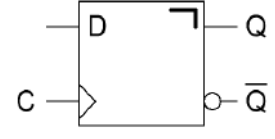

Flip-Flop 1   Flip-Flop 2   Flip-Flop 3   Flip-Flop 4

Exercise 4 (6 points)

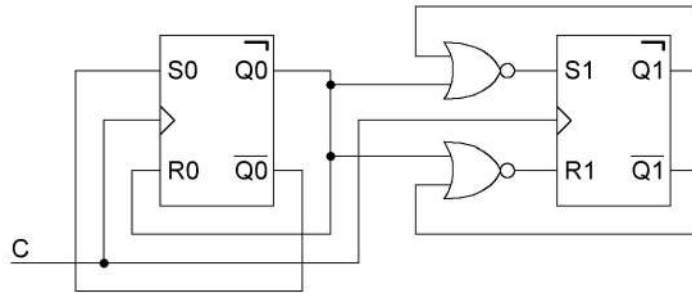Complete the timing diagrams shown on the <u>answer sheet</u> (up to the last vertical dotted line) for the following circuits.
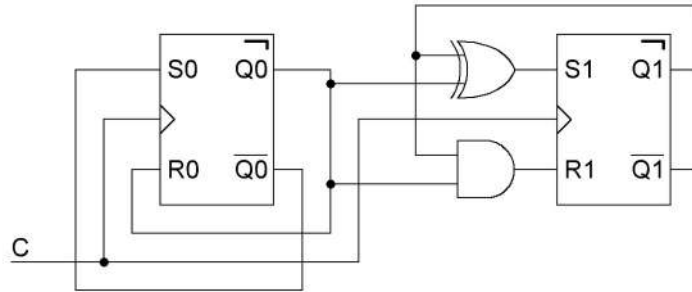

Figure 1

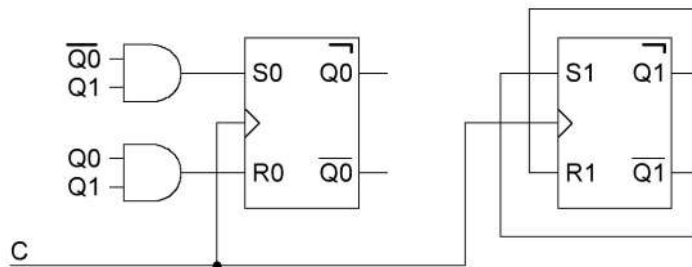Figure 2

Figure 3