

Midterm Exam S2

Computer Architecture

Duration: 1 hr 30 min

Answer on the answer sheet only.

Do not show any calculation unless you are explicitly asked.

Do not use a pencil or red ink.

Exercise 1 (9 points)

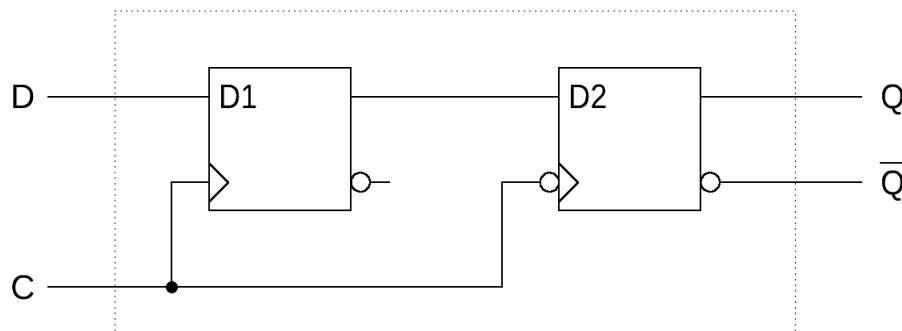
- Convert the numbers given on the [answer sheet](#) into their **single-precision** IEEE-754 representations. Write down the final result in its **binary form** and specify the three fields.
- Convert the **double-precision** IEEE-754 words given on the [answer sheet](#) into their associated representations. 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.

- For the single precision, what is the smallest number (greater than 0) which, when added to 16, gives a different result from 16?
- 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)

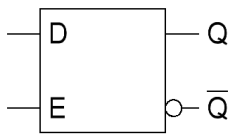
Let us consider the following circuit:



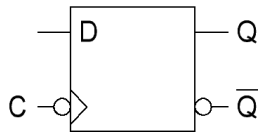
- Complete the timing diagrams shown on the [answer sheet](#) (up to the last vertical dotted line).
- If we consider the whole circuit as only one D flip-flop, what type of flip-flop is it?

Exercise 3 (2 points)

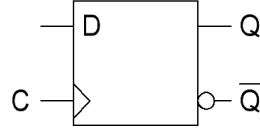
Give the type of each flip-flop below (answer on the [answer sheet](#)).



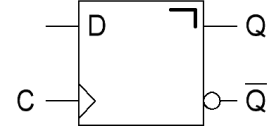
Flip-Flop 1



Flip-Flop 2



Flip-Flop 3



Flip-Flop 4

Exercise 4 (6 points)

Complete the timing diagrams shown on the [answer sheet](#) (up to the last vertical dotted line) for the following circuits.

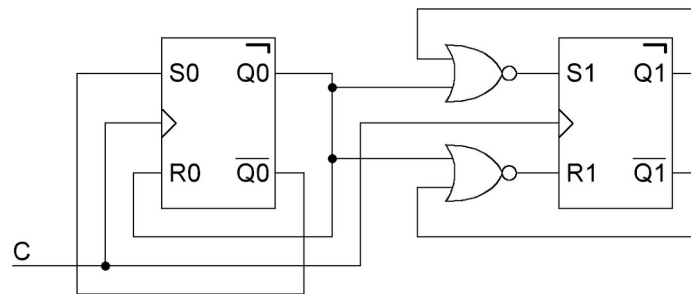


Figure 1

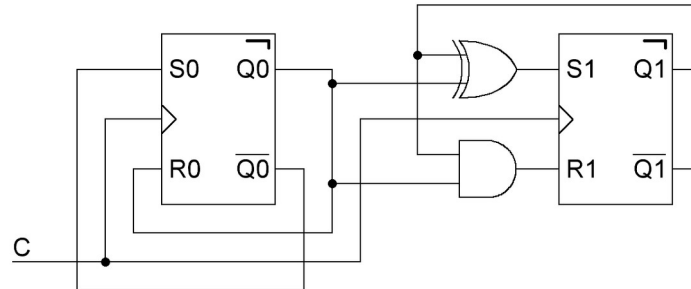


Figure 2

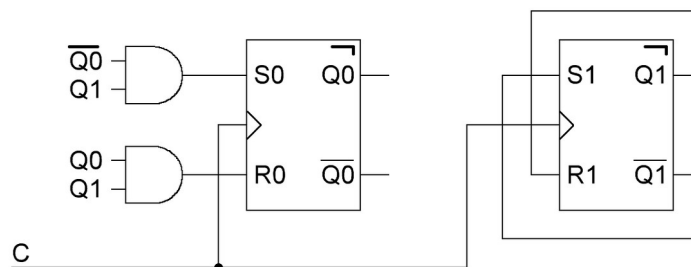


Figure 3