

FF ASSIGNMENT

Total Points: 25 | Questions: 5 | Date: February 19, 2026

AI-generated undergraduate-level electrical assignment. Contains 5 questions covering key concepts.

Question 1

5.0 points

Examine the circuit shown below, which consists of two D flip-flops, FF1 and FF2, and a combinational logic that performs the AND operation on the outputs of these flip-flops. The inputs to the flip-flops are connected such that the D input of FF1 is '1' and the D input of FF2 is connected to the Q output of FF1. What will be the output waveform of the circuit for the first five clock cycles if the initial states are $Q_1=0$ and $Q_2=0$?

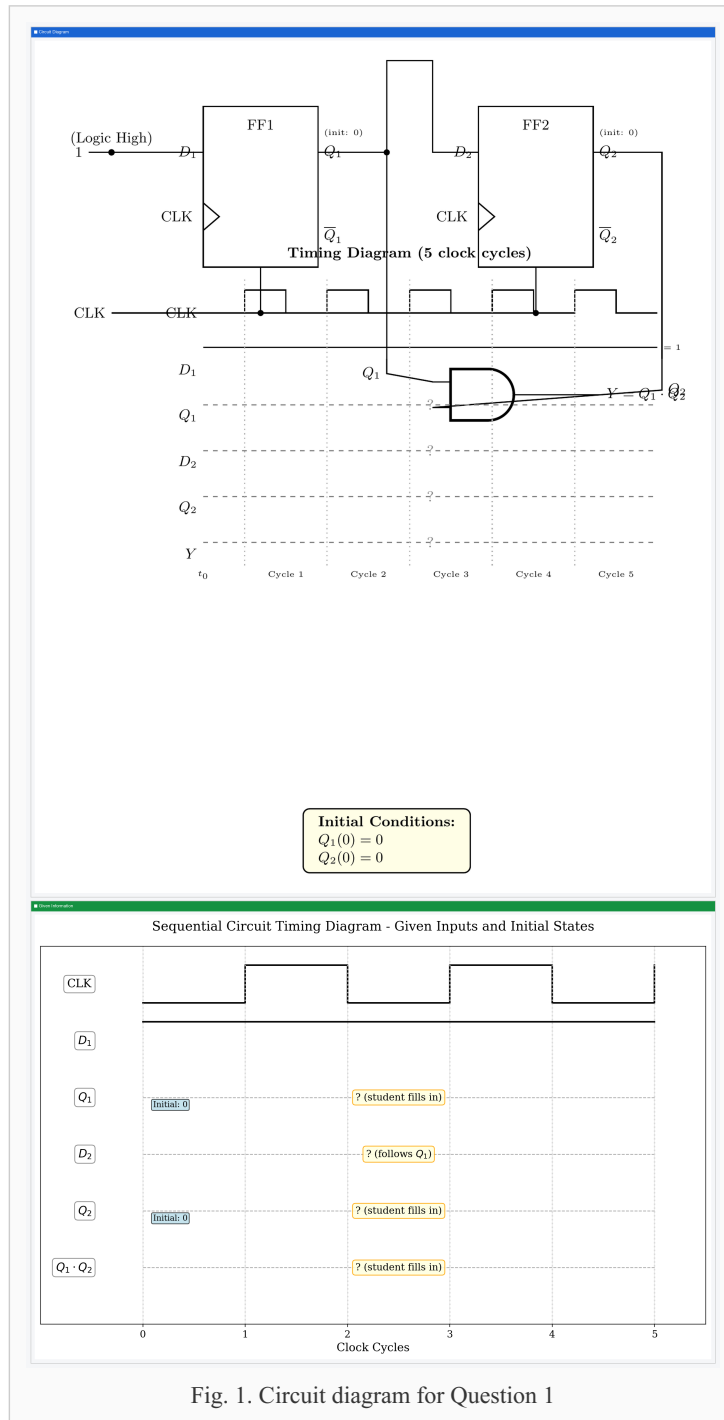


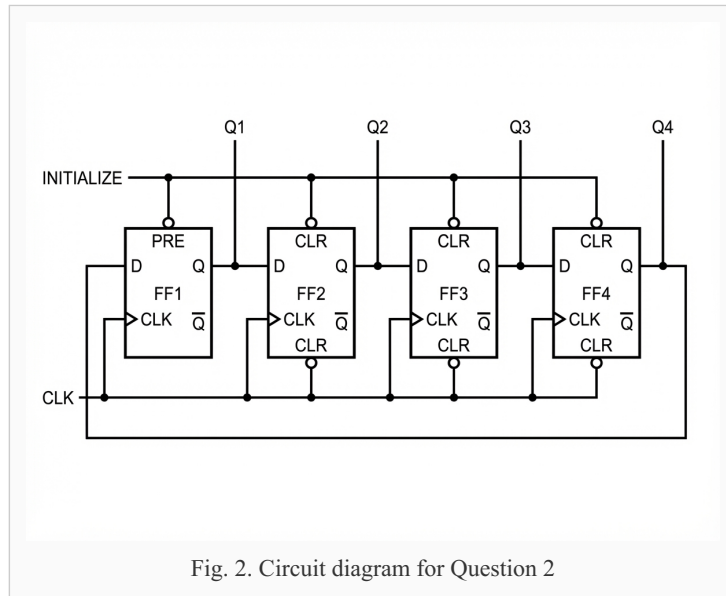
Fig. 1. Circuit diagram for Question 1

- A. 00, 10, 11, 11, 11
- B. 10, 11, 11, 11, 11
- C. 00, 01, 11, 11, 11
- D. 01, 10, 11, 11, 11

Question 2

5.0 points

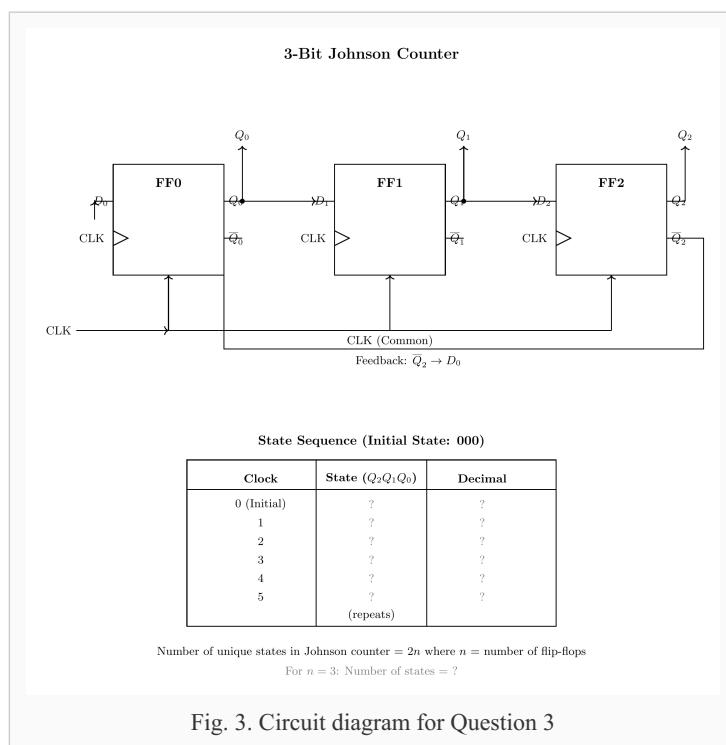
Explain how the ring counter with 4 flip-flops in the circuit shown below operates, and determine the sequence of outputs starting from an initial state of 1000 over 8 clock cycles.



Question 3

5.0 points

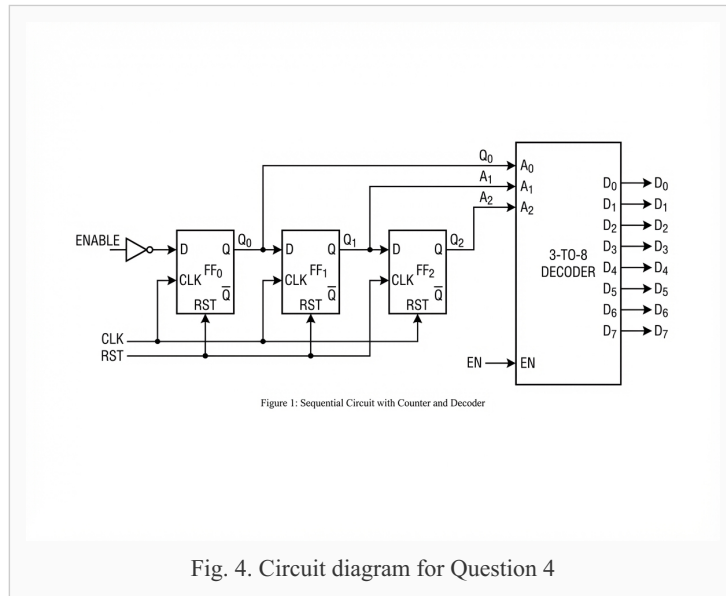
Calculate the number of unique states in the Johnson counter using 3 flip-flops in the circuit shown below, and provide the state sequence starting from an initial state of 000.



Question 4

5.0 points

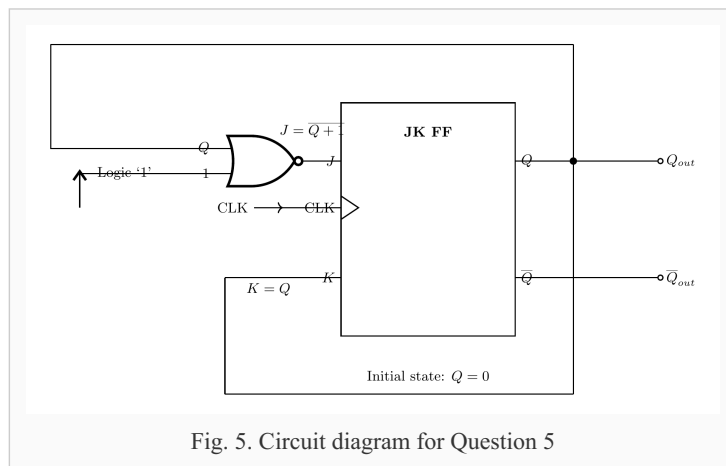
Describe the function of a decoder in the sequential circuit shown below and how it can be used in conjunction with a counter to extend the state sequence.



Question 5

5.0 points

Consider the circuit shown below consisting of a JK flip-flop and a combinational logic circuit that implements a NOR gate. If Q and a constant '1' are inputs to the NOR gate, and the JK flip-flop is configured with $J=Q'$ and $K=Q$, how will the output of the flip-flop change with each clock cycle, starting from an initial state $Q=0$?



- A. Toggle on each clock cycle.
- B. Remain in initial state.
- C. Toggle every two clock cycles.
- D. Output a constant zero.