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Paper = DLD

Program = BS(S.E)

Semester = 3rd

Q1 = Draw and explain the logic diagram for each of the following :

(a) A circuit for adding or subtracting two 4-bit number.

Ans: In digital circuits, A binary Adder-Subtractor is one which is capable of both addition and subtraction of binary numbers in one circuit itself. The operation

being performed depends upon the binary value the control signal holds. It is one of the components of ALU (Arithmetic Logic Unit).

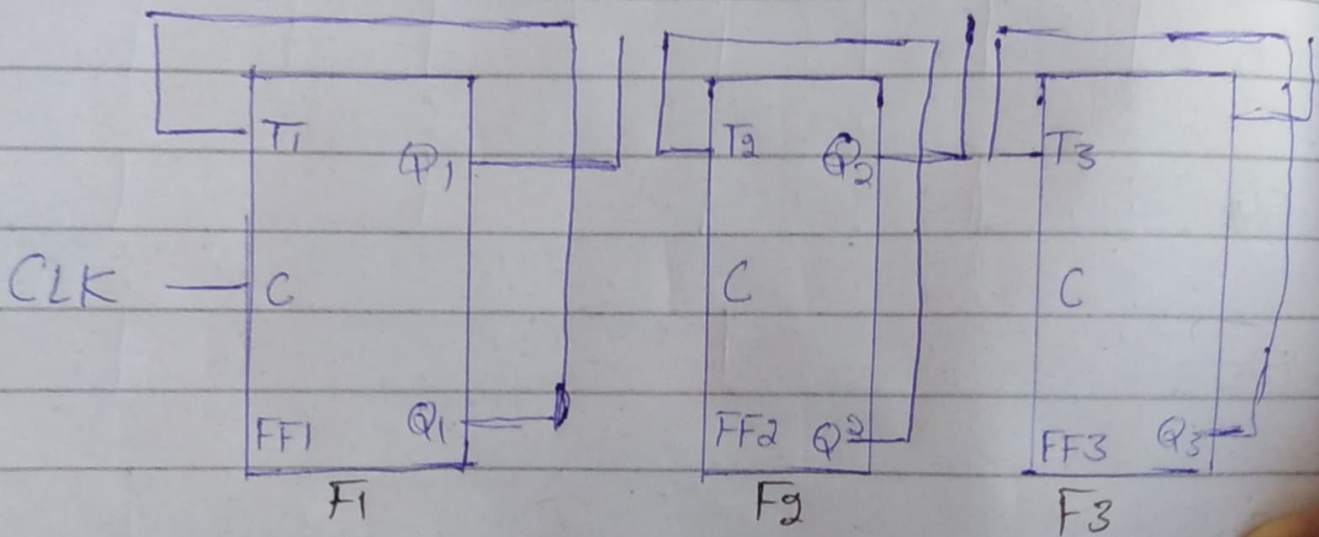
The circuit requires prerequisite knowledge of XOR gate, Binary Addition and Subtraction, Full Adder.

The circuit consists of 4 full adders since we are performing operation on 4-bit numbers. There is a control line k that holds a binary value of either 0 or 1, which determines that the operation being carried out is addition or subtraction.

For an n -bit binary adder-subtractor, we use n number of full adders.

Q1 =

(d) Frequency divider (use 3 J-K flip-flops and assume 16 KHz frequency of initial wave-form -



➡ Here we assume the frequency is 16 KHz

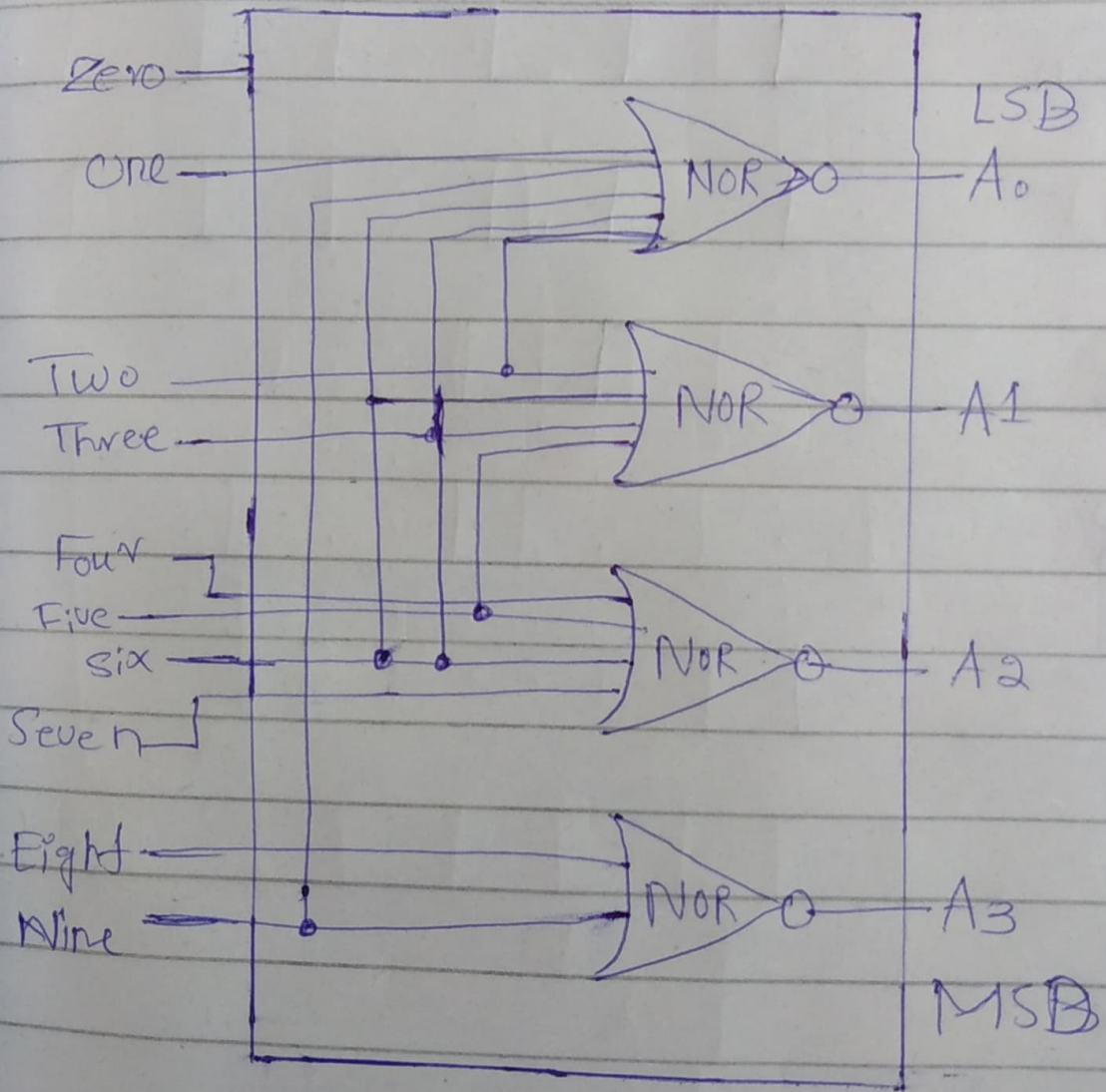
➡ So

$$f/2, f = 16/2$$

$$f = 8 \text{ KHz}$$

Q1 :-

(C) decimal to BCD encoder.

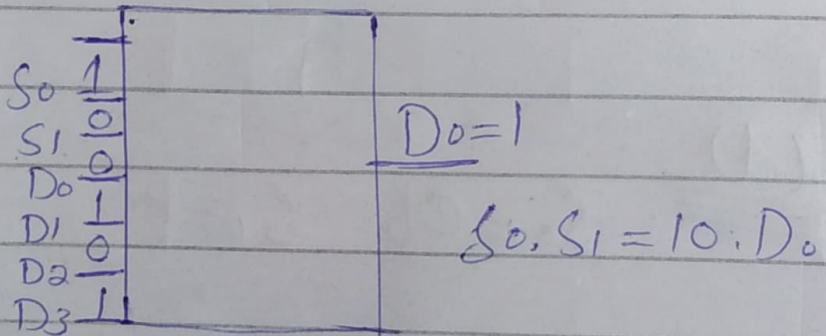


Q2:- For the 4-Input multiplexer, data inputs are given as:

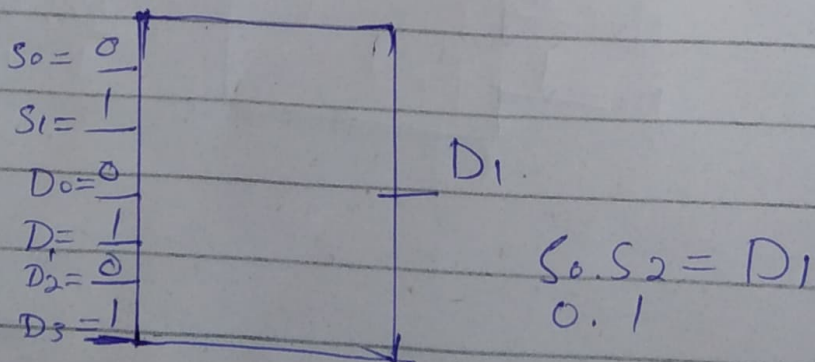
$$D_0 = 0, D_1 = 1, D_2 = 0, D_3 = 1$$

⇒ Find the output of Y if the select inputs are given as:

(a) $S_0 = 1, S_1 = 0$

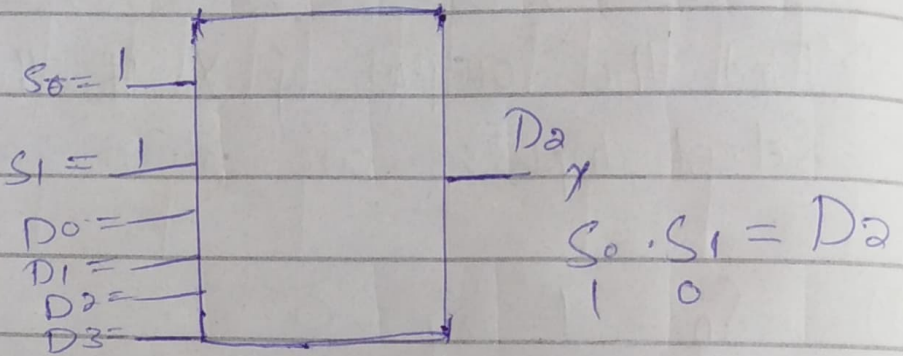


(b) $S_0 = 0, S_1 = 1$



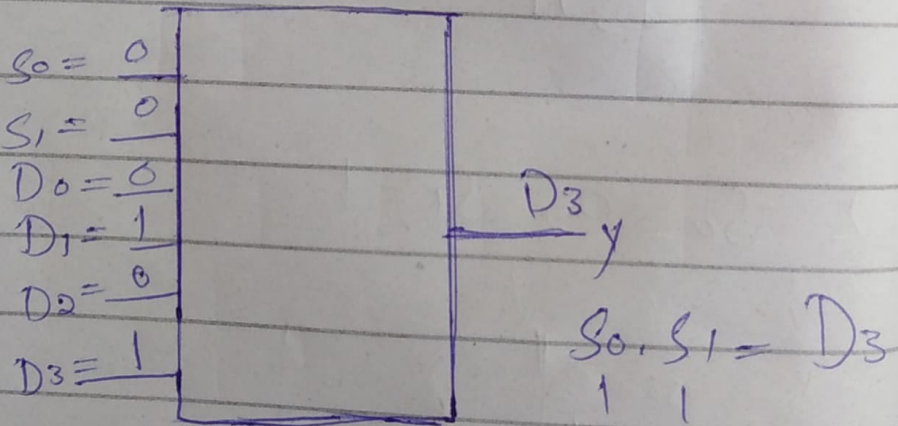
(c)

$$S_0 = 1, S_1 = 1$$



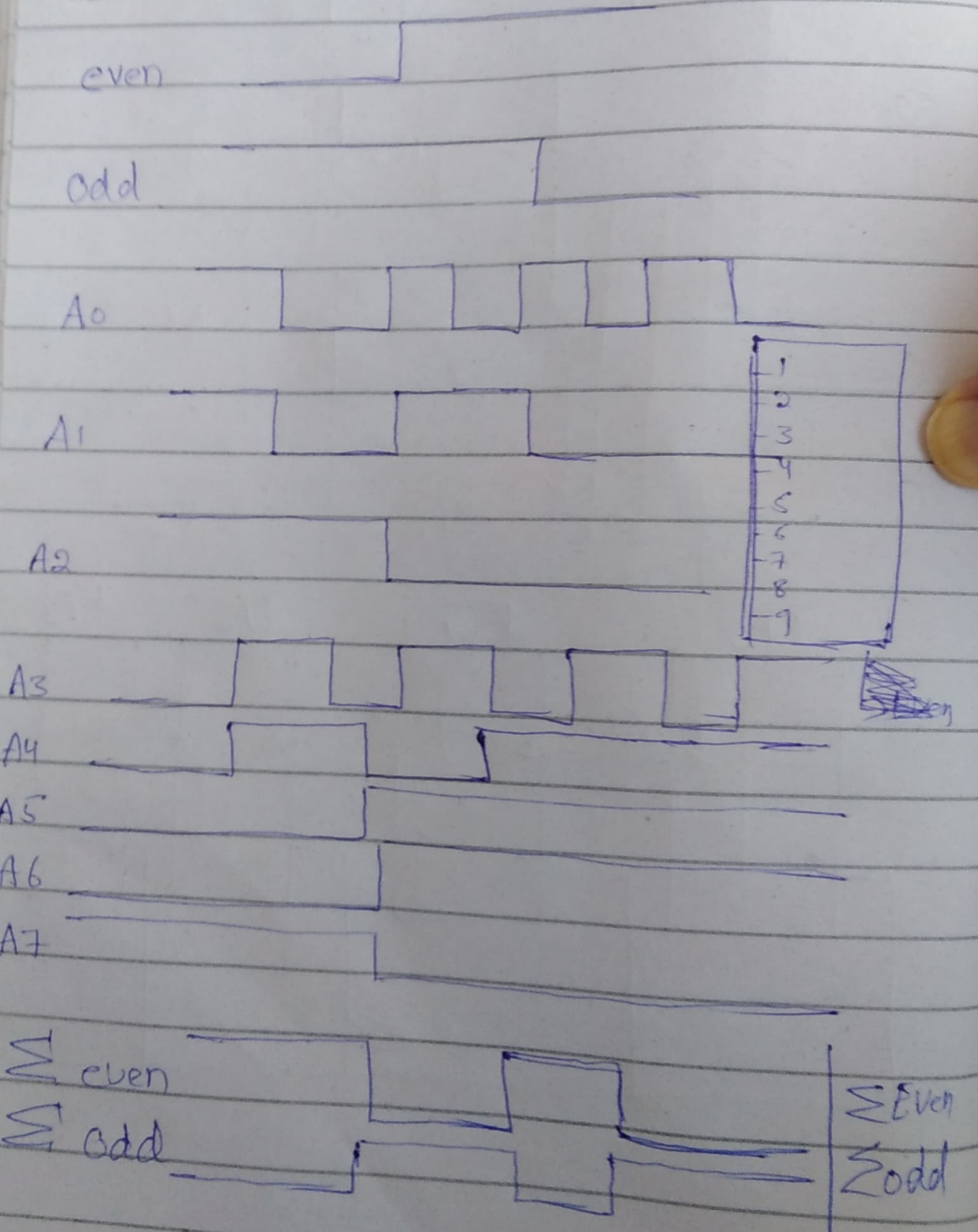
(d)

$$S_0 = 0, S_1 = 0$$

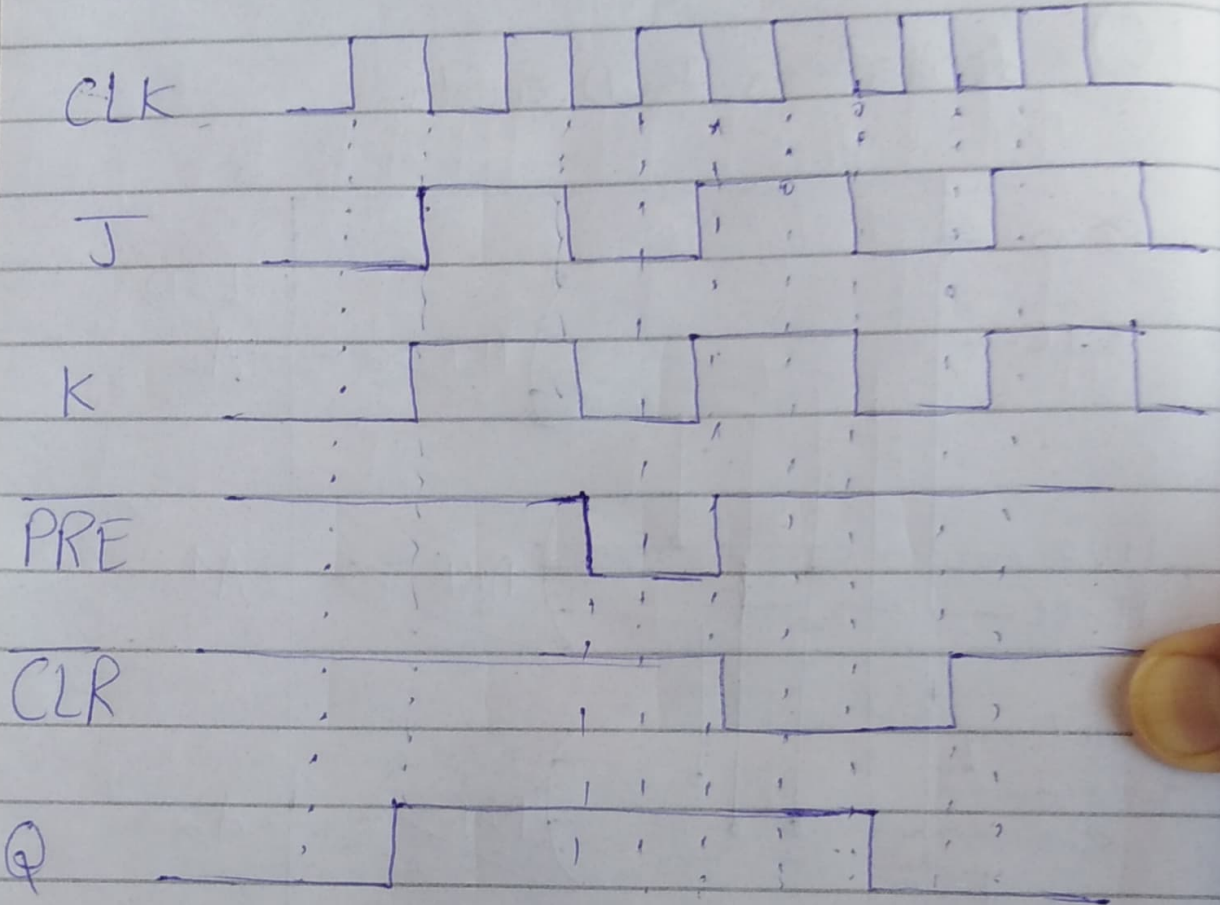


Q3: Timing diagram in figure 01 shows inputs to a 9-bit

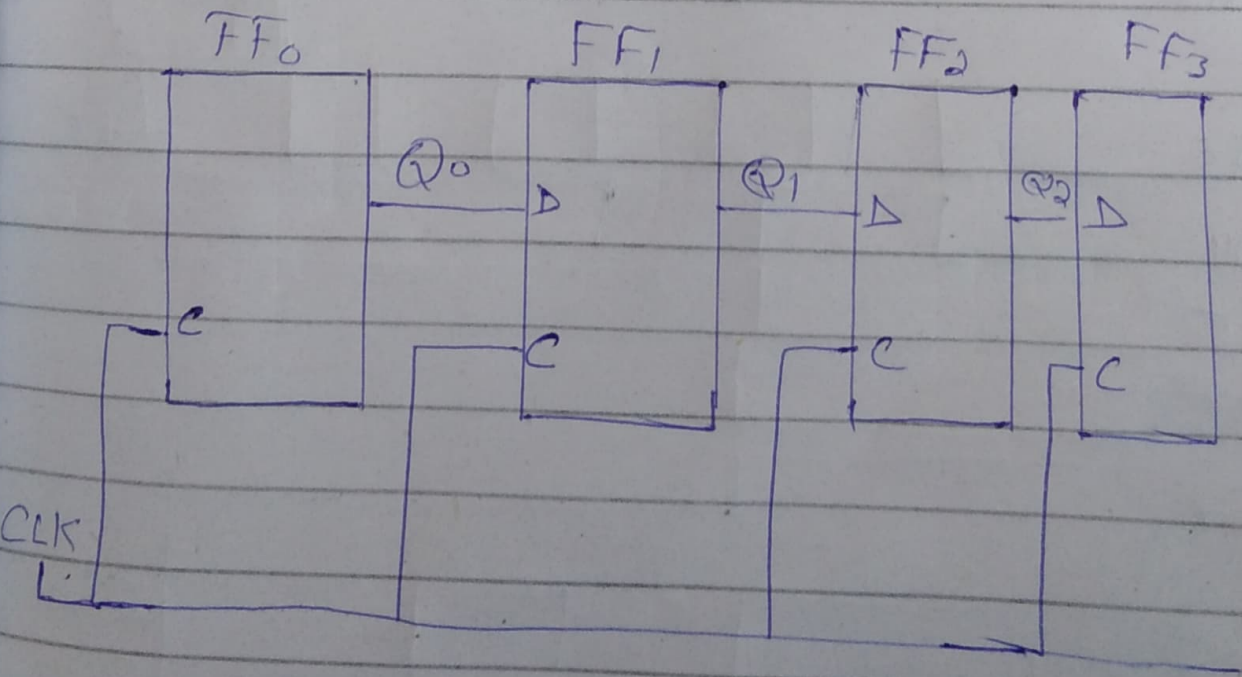
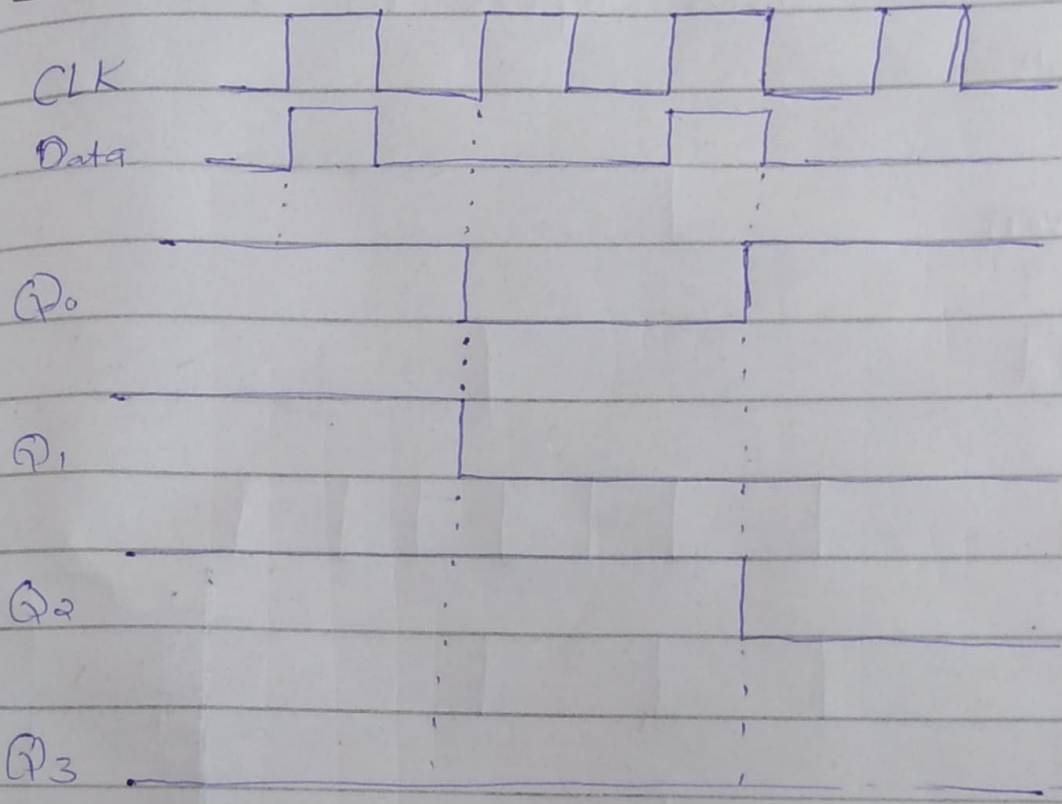
Sol:



Q4:-

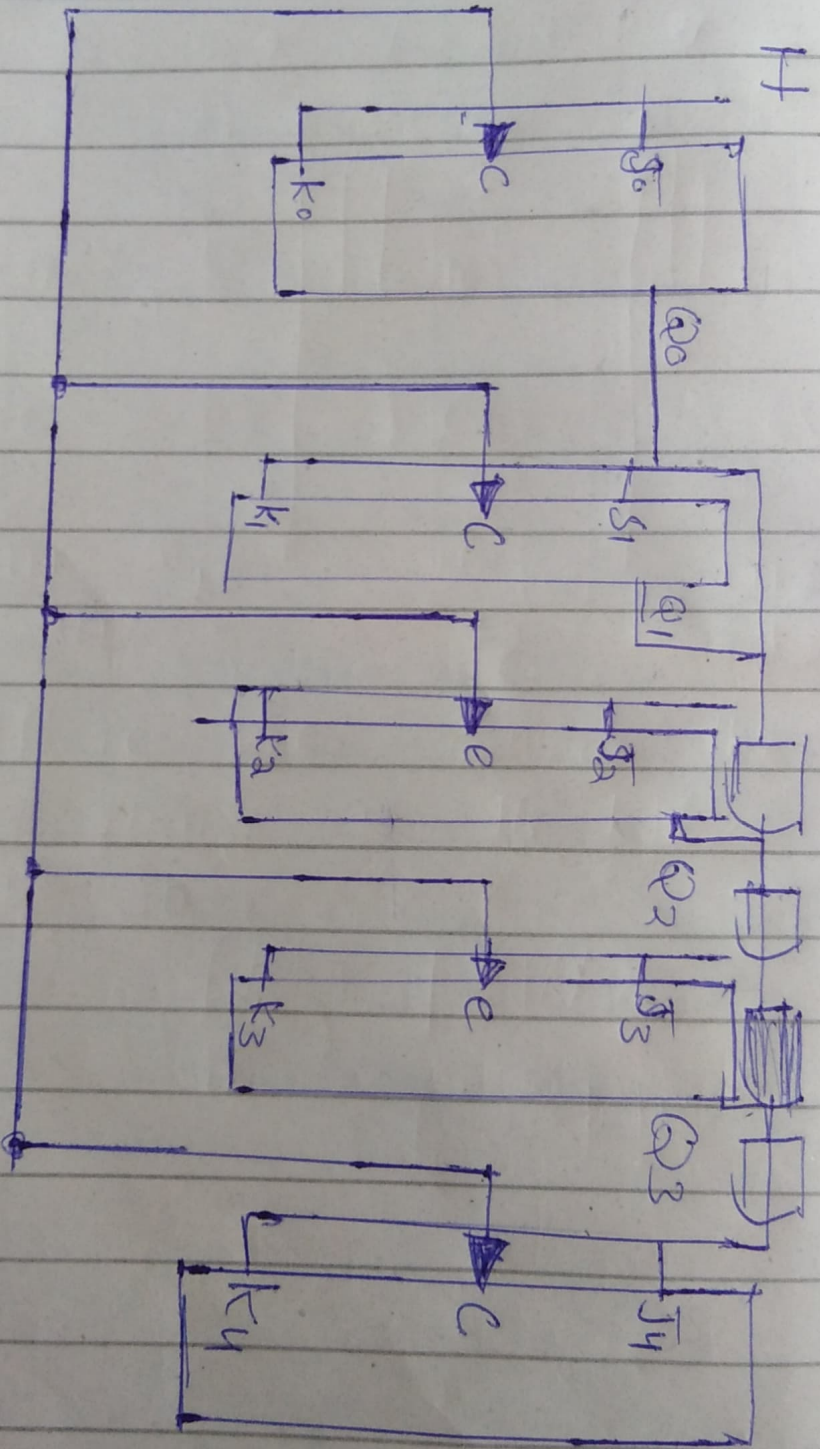


Q5 :-



CLK

Q6:



Q6 :-

