Lesson 15

Digital Logic
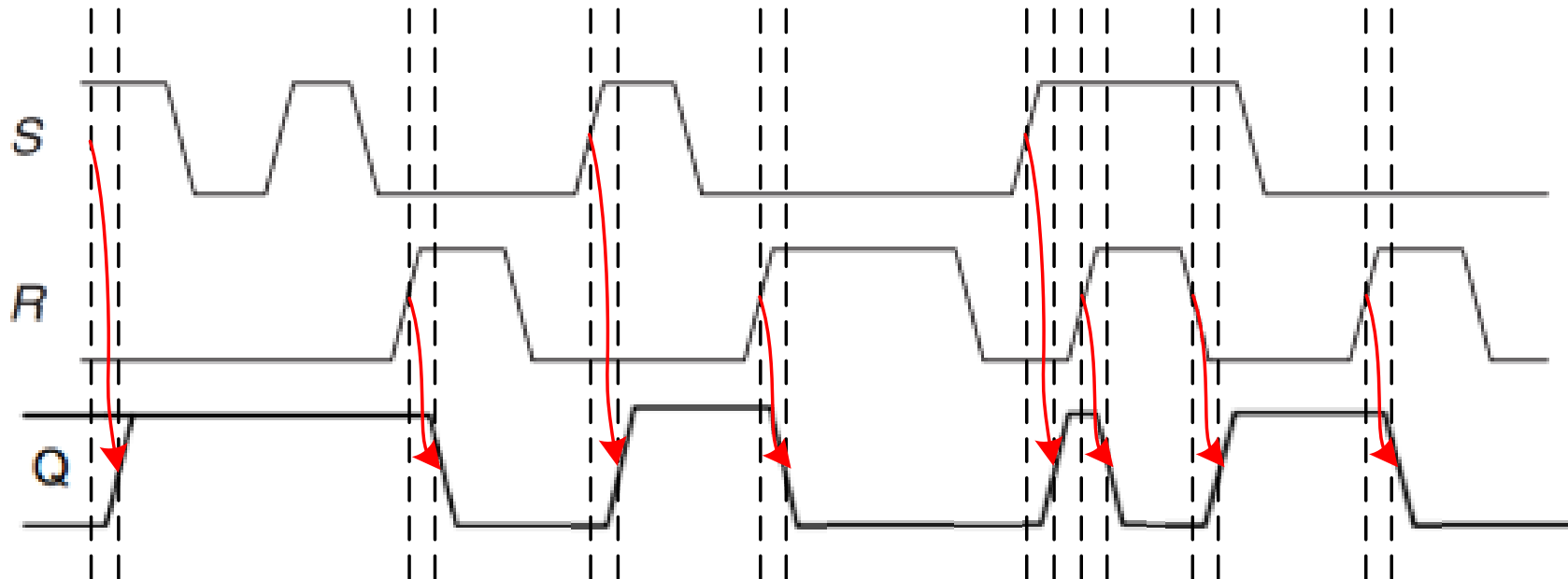
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SEQUENTIAL LOGIC DESIGN

ELSEVIER

In-class Test 3 Answers

- 3.1 (20 points)

S	R	Q
0	0	Qprev
0	1	0
1	0	1
1	1	0

- 3.2 (20points)

clk	D	Q
0	X	Qprev
1	0	0
1	1	1
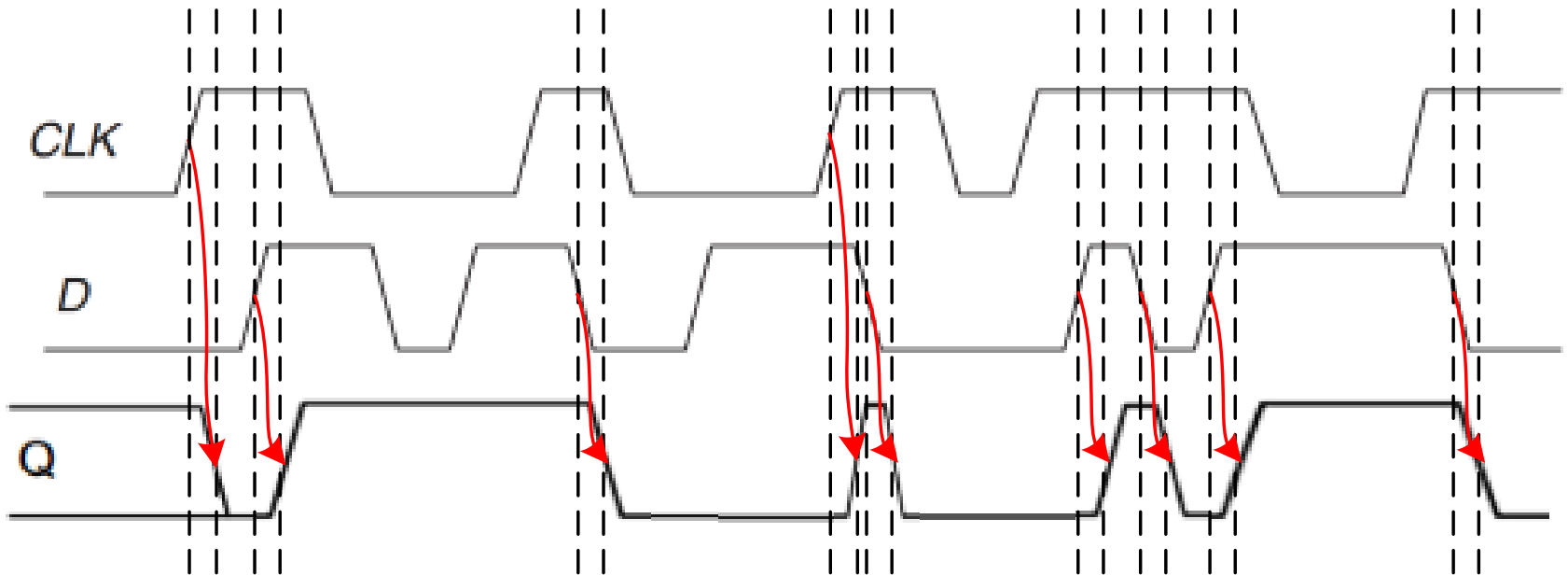
In-class Test 3 Answers

- ## 3.3 (20 points)
  - FSM functionality: keep track of 4 students' moods (5 different moods).
  - State? => Use one state to represent 4 students' one possible mood combination, e.g., S0 represents for that student A, B, C and D are HAPPY, and S1 means that student A, B and C are HAPPY but student D is SAD.
  - Consequently, totally $5^4=625$ states for FSM.
  - Hence, minimum number of bits of the state variable is calculated as:

$$\because 9 < \log_2 625 < 10,$$

$$\therefore N = 10.$$

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In-class Test 3 Answers

- ## 3.4 (40 points) **MOORE FSM!**
  - – FSM functionality: Output 1 for one clock cycle when A is TRUE followed by B is TRUE.
  - – Binary encoded next state table:

current state		inputs		next state	
s_1	s_0	a	b	s'_1	s'_0
0	0	0	X	0	0
0	0	1	X	0	1
0	1	X	0	0	0
0	1	X	1	1	0
1	0	X	X	0	0

In-class Test 3 Answers

- ## 3.4 (40 points)
  - Binary encoded output table:

current state		output
s_1	s_0	q
0	0	0
0	1	0
1	0	1

  - Boolean equations:

$$S_1' = S_0 B$$

$$S_0' = \overline{S_1}\,\overline{S_0} A$$

$$Q = S_1$$

- 3.4 (40 points)
  - FSM schematic: