Sétif 1 University
Faculty of Sciences
Common Core Mathematics and Computer Science

2nd semester (year 2024/25)
Machine Structures 2 course
Kara Abdelaziz professor

Machine Structures 2 resit exam

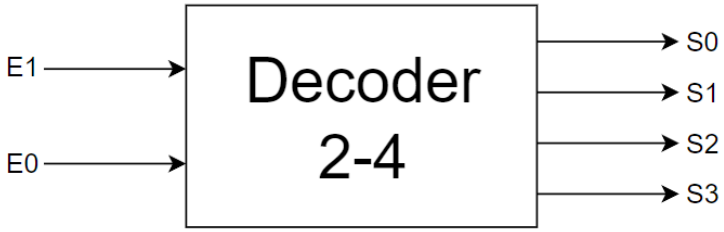
(duration 1h30)

Exercise 1 :(4 points)

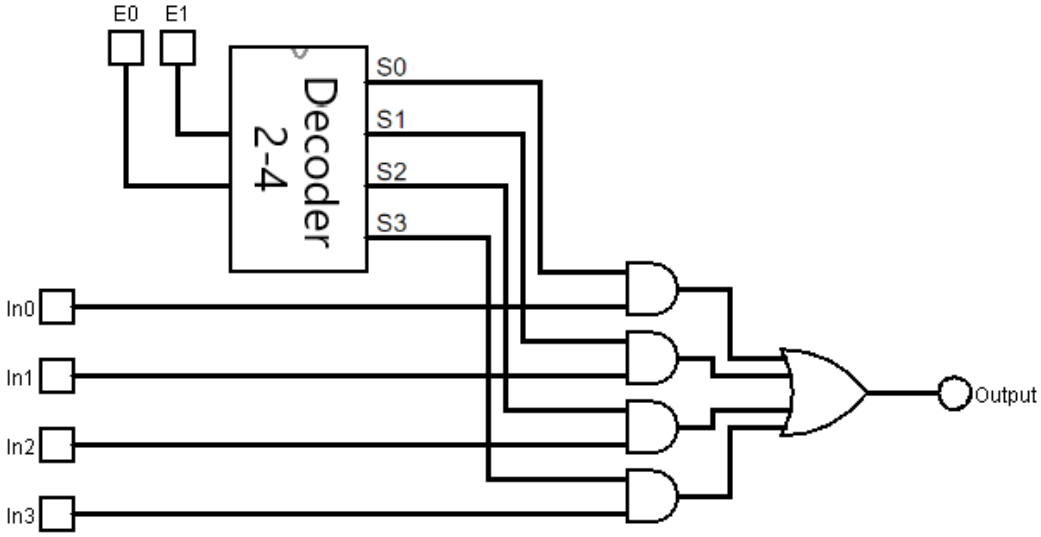
1. How information is represented in Digital Electronics ?
2. Give the Boolean Expression and the Truth Table for an XOR gate.
3. What is the difference in behavior (السلوك) between a D-Latch and a D-FlipFlop regarding (في ما يتعلق) when they are transparent to input changes ?
4. Inside a Sequential Circuit designed using the 7-steps method, what represent the values inside the FlipFlops register ?

Exercise 2 :(5 points)

Like described in the course, a Decoder is a Combinational Circuit that has a binary encoded input. So that, for each unique combination of binary values on its input lines, only one of its output lines will be active (put to 1). All other output lines will be inactive (put to 0). The figure below describe a Decoder 2-4.

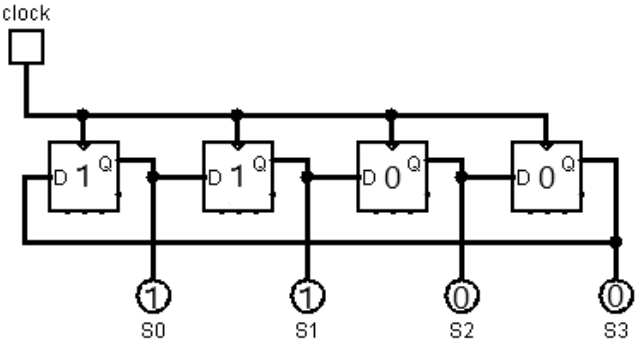


<u>Question</u> : Use the 5-step method to design the Combinational Circuit of the Decoder 2-4 described above.



1. Examining the previous schematics, give the result of *output* by executing the circuit if the inputs were (E1,E0) = (0,0) and (In3,In2,In1,In0) = (0,0,0,1). And another execution if inputs were (E1,E0) = (1,1) and (In3,In2,In1,In0) = (1,1,1,1).
2. Based on the previous results, name the circuit created in the schematics.

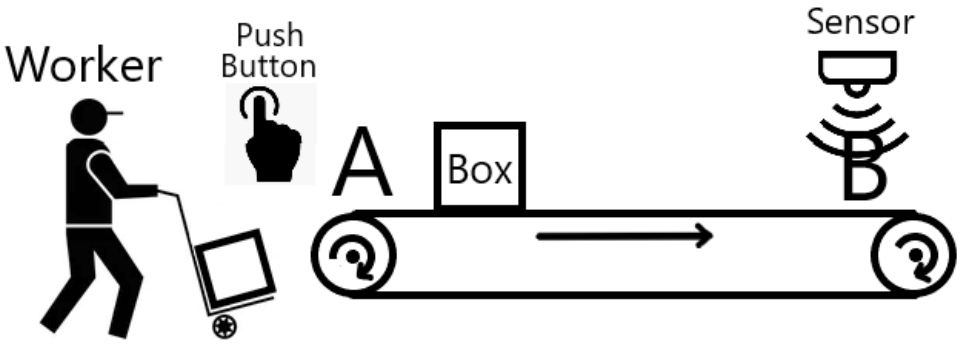
Exercise 3 :(4 points)



1. Draw the timing diagram of the circuit shown above. It has to show the execution through (عبر) 4 clock cycles, tracing the clock, S0, S1, S2, and S3.
2. Name the circuit implemented in the diagram above.

Exercise 4 :(7 points)

We want to design a Sequential Circuit that automatically controls a Belt Conveyor in a factory (حزام ناقل في مصنع), represented in the picture below. The Belt Conveyor can transport only <u>one box at a time</u> from point A to point B. The worker puts the box on the Belt Conveyor at the point A, while (عندما) the Belt is <u>stoped</u>. Then he pushes a button to activate the Belt (the button emits logical 1 when pushed). The Belt rolls (تدور) and transport the box to the point B. In the point B there are a sensor (جهاز استشعار) that can detect the box arrival (الوصول). It emits (يرسل) to the Sequential Circuit a logical 1 when it detects the box, otherwise 0. The Belt doesn't move until the box is picked up (حتى تُؤخذ). The goal of the Sequential Circuit is to activate (logical 1) or desactivate (logical 0) the motor (المحرك) that rolls or stops the Belt Conveyor.



Question : Use the 7-steps method to design the Sequetial Circuit of the Belt Conveyor controller.

دعوة بالتوفيق