Project 2 SEQUENTIAL CIRCUITS

PROBLEM DEFINITION

It is requested to design and implement a synchronous sequential circuit which detects two different 4-bit sequences A and B. The constraints are given below.

1. **A** is the 4-bit binary code of your **school number's digit before the last one**.
2. **B** is the 4-bit binary code of your **school number's last digit**. (If **A=B** choose a different digit)
3. The circuit will have 1-bit data input **X**, 1-bit data output **Y**, 1-bit **CLK** (clock) input and 1-bit **RST** (reset) input.
4. **A and B may overlap**. Your circuit will detect both which means your circuit will not ignore detecting another sequences while detecting any sequence. Circuit must detect all overlaps if exists. A overlapping A, A overlapping B, B overlapping B and B overlapping A are valid situations.
5. **When an A or a B word is detected**, your circuit **sets its Y** output. Otherwise the output remains at reset.
6. You should clearly explain your approach on solving the problem at hand.
7. You should draw your **state diagram** and report it.
8. Students should gather timing and resource information from Vivado post-implementation reports. Your project report should include information about **timing and area performance** of your design.
9. Try out timing constraints and/or Vivado synthesis and implementation strategies (using synthesis and implementation settings menus in Vivado) to improve your design's performance metrics until you think that you reach the highest clock frequency implementation. Show your related work in your report.
10. You should **write your own test code** and verify your circuit with this code. The test code should have an input pattern with **all possible** overlapping and discrete A and B word positions on the input bit stream.
11. Your report (max. 4 pages is encouraged) should include your analysis about the **circuit type** (Mealy/Moore), the complete analysis about the existence of **hazards** (zararlı hatalı çıkışlar).

Do not include your codes, as you will be uploading your archived project file separately. Your archived project is expected to produce the same results you will be presenting in your report.