EE214 - Report 6

Sequence Generator

Harsh S Roniyar (22B3942)
FR-19/T-19

16th September 2023

Contents

Introduction

0.1 Objective

The aim of the assignment was to implement a Sequence Generator to print (`110011`) repeatedly as shown in the figure below using Structural-Dataflow design using D-Flipflops.

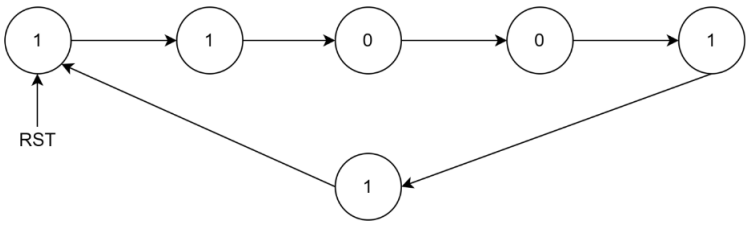


Figure 1: Sequence Generator

Following that, we also had to perform an RTL and then a ScanChain Simulation of the design.

0.2 Overview

In this report, I have presented my work done on Quartus using VHDL during the sixth lab.

I have also done design verification using ScanChain tool on Xen-10 FPGA board and verified my design. The ScanChain output is also shown in the report.

The circuit presented in the report has the RTL Viewer followed by the ModelSim Waveform and Transcript obtained from Quartus.

Chapter 1

State Diagram and K-Maps

This section contains the outline of the `Sequence Generator` made in the lab.

15/09/2023

Week 6 : Problem - Set 6

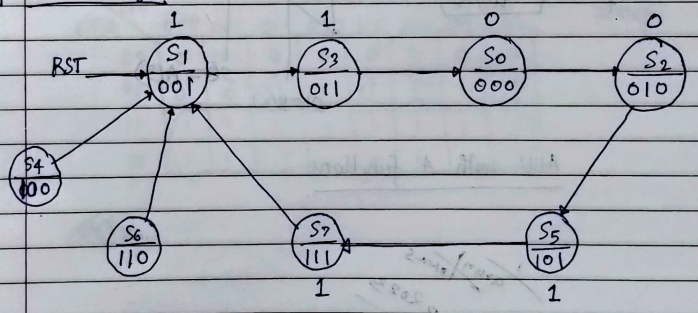
6 states → 3 bits → 8 states
⇒ 2 unused states

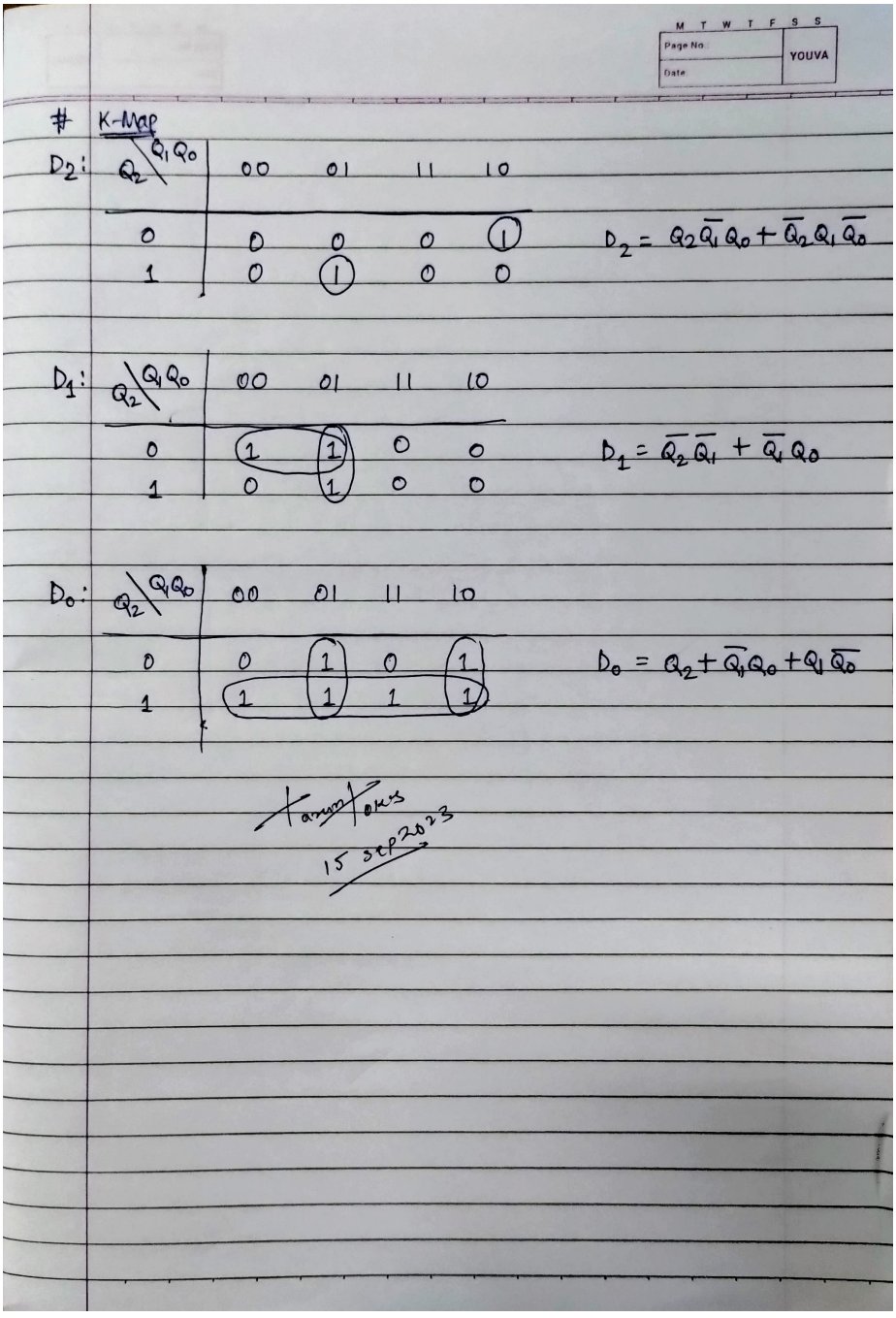
State Table

RESET.

Q_2	Q_1	Q_0	NQ_2	NQ_1	NQ_0	D_2	D_1	D_0
0	0	1	0	1	1	0	1	1
0	1	1	0	0	0	0	0	0
0	0	0	0	1	0	0	1	0
0	1	0	1	0	1	1	0	1
1	0	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1
Unused states. 1	0	0	0	0	1	0	0	1
1	1	0	0	0	1	0	0	1

State Diagram





K-Map

D_2:

Q_2 \ Q_1Q_0	00	01	11	10
0	0	0	0	1
1	0	1	0	0

$D_2 = Q_2\bar{Q_1}Q_0 + \bar{Q_2}Q_1\bar{Q_0}$

D_1:

Q_2 \ Q_1Q_0	00	01	11	10
0	1	1	0	0
1	0	1	0	0

$D_1 = \bar{Q_2}\bar{Q_1} + \bar{Q_1}Q_0$

D_0:

Q_2 \ Q_1Q_0	00	01	11	10
0	0	1	0	1
1	1	1	1	1

$D_0 = Q_2 + \bar{Q_1}Q_0 + Q_1\bar{Q_0}$

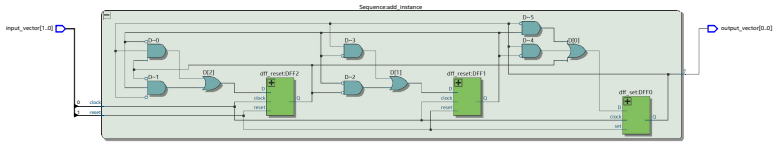
Tamil Selvi
15 Sep 2023

Chapter 2

Sequence Generator

2.1 RTL Viewer

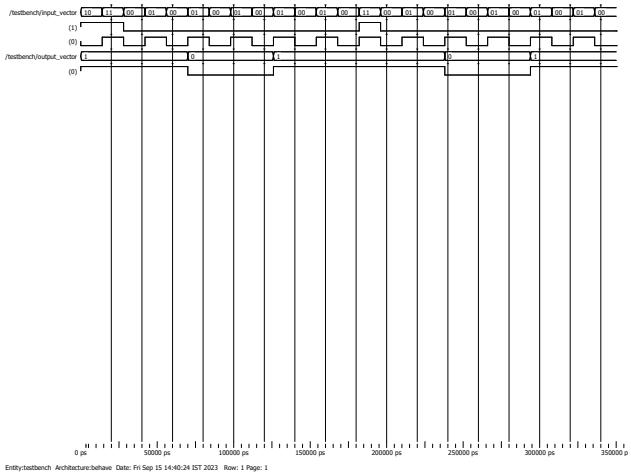
Date: September 15, 2023 Project: Sequence



Page 1 of 1 Revision: DUT

2.2 ModelSim and RTL Simulations

RTL simulations of Sequence Generator gave the following ModelSim Waveform



RTL simulations of Sequence Generator gave the following transcript

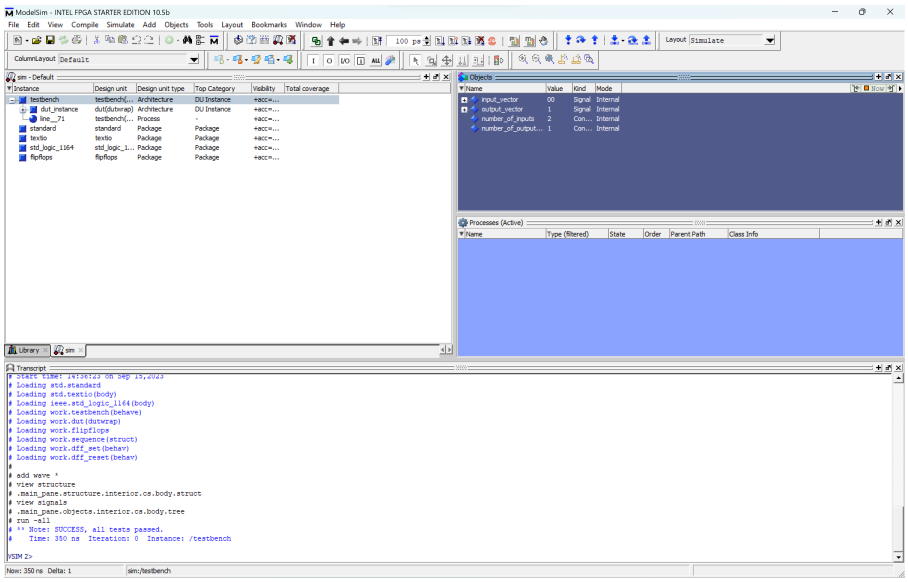


Figure 2.1: Successful Transcript of `Sequence Generator`

2.3 ScanChain

The ScanChain after dumping the `.svf` file gave the following output in `out123.txt`

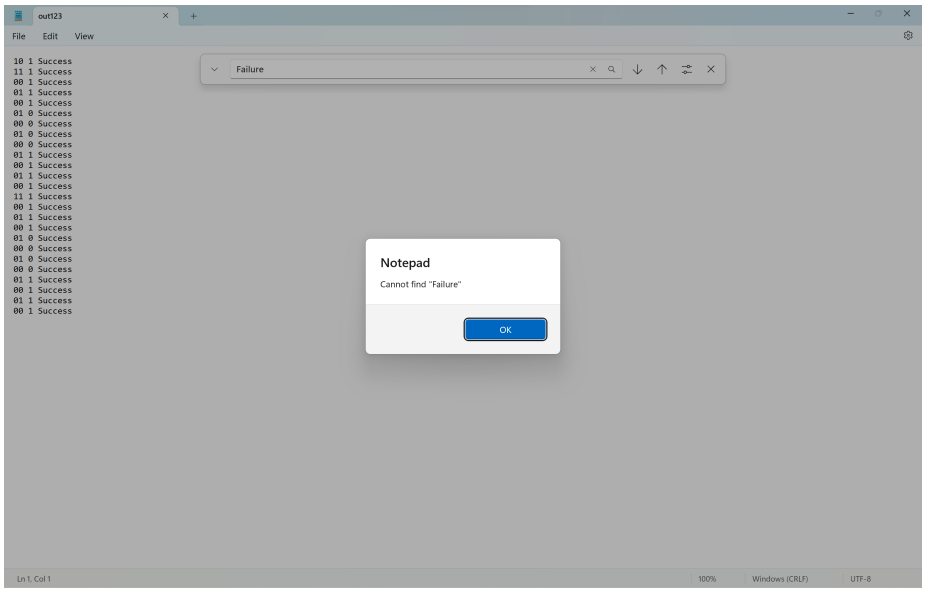


Figure 2.2: Not a single Failure in the ScanChain output.

THANK YOU!