

## Experiment 11

### Asynchronous Finite State Machine

Given the following characteristic equations for the next state variables of an asynchronous finite state machine:

$$Y_1 = x_1\bar{x}_2 + y_2\bar{x}_1 + y_1\bar{y}_2x_2$$

$$Y_2 = x_1 + y_2\bar{x}_2$$

1. Determine the transition table and identify the stable states.
2. Identify any oscillations and races and indicate their types.
3. Write a VHDL behavioral description which implements the characteristic equations and includes the following:
  - a. Entity declaration
  - b. Behavioral architecture body
  - c. An appropriate testbench
4. Simulate and Print the resulting waveforms for all possible inputs and state transitions.
  - a. Set the propagation delays of Y1 and Y2 to demonstrate normal operation.
  - b. Adjust the propagation delays to demonstrate the results of a critical race.
5. Draw a detailed diagram showing all the pin configurations.
6. Implement the above circuit in hardware, using the TTL devices from the parts list.
7. Compare the results of two approaches with respect to the timing characteristics of the outputs.