Experiment 2

Sequential Circuits

A sequential circuit is a circuit whose output depends on the current input and past inputs. Flipflop is the basic building block in sequential circuits. Some uses in digital systems are:

- Memories
- Shift Registers
- Counters

Lab Tasks

For this lab, you are required to design and verify the functionality of

1. A 32 bit counter.
2. A 2KB memory, which is word alligned and byte addressable. It has write-enabled sychronous write and asychronous read. Read its contents from .mem file using readmemh and update the file using writememh.
3. A 32-bit register file with 16 registers such that two registers value can be read out and one can be written to if write enable signal is there. Register at index 0 gives zero on read and writes are ignored.

```
reg [31:0] ex2_memory [0:31];
initial begin
    $readmemh("ex2.mem",ex2_memory);
end

reg [31:0] ex1_memory [31:0];
always_ff @ (posedge clk) begin
    $writememh("datamem.mem", ex1_memory);
end
```

Listing 1: Usage of readmemh and writememh