計算機システム設計論　演習問題(5)

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コードを以下に示す。

module fifo(in, we, full, out, re, empty, clk, rst);

input [7:0] in;

input we;

output logic full;

output [7:0] out;

input re;

output logic empty;

input clk, rst;

logic [7:0] mem[7:0];

logic [2:0] head, tail, headi;

logic [7:0] out;

always\_ff @(posedge clk) begin

if(rst) begin

head <= 0;

tail <= 0;

end else begin

if(we && ~full) begin

head <= head + 1;

mem[head] <= in;

end

if(re && ~empty) begin

tail <= tail + 1;

out <= mem[tail];

end else begin

out <= 0;

end

end

end

always\_comb begin

headi = head + 1;

if(head == tail) empty = 1'b1;

else empty = 1'b0;

if(headi == tail) full = 1'b1;

else full = 1'b0;

end

endmodule

module fifotest;

logic [7:0] in, out;

logic we, re;

logic clk, rst;

fifo fifo(in, we, full, out, re, empty, clk, rst);

always #5 clk = ~clk;

initial begin

$dumpfile("fifo.vcd");

$dumpvars(0, fifotest);

rst = 1;

clk = 0;

we = 0;

re = 0;

in = 5;

#30;

rst = 0;

we = 1;

#10;

in = 6;

#10;

in = 7;

#10

we = 0;

#10

re = 1;

#10

re = 0;

we = 1;

in = 8;

#10

in = 9;

#10

in = 10;

#10

in = 11;

#10

in = 12;

#10

in = 13;

#10

in = 14;

#10

in = 15;

re = 1;

#10

in = 16;

#50

$finish;

end

endmodule

またシミュレーションの結果も示す。

A screenshot of a computer screen

Description automatically generated with medium confidence

このようにFIFOをシミュレーションすることができた。