ISTANBUL TECHNICAL UNIVERSITY

COMPUTER ENGINEERING DEPARTMENT

BLG 222E

COMPUTER ORGANIZATION
PROJECT REPORT

PROJECT NO : 1

GROUP NO : G71

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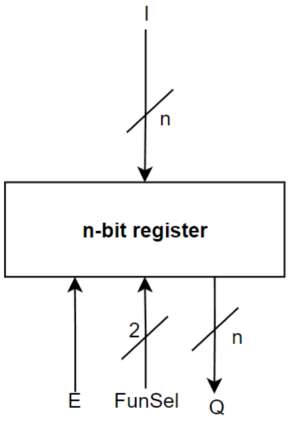
1. ÖZGÜR SEFEROĞLU: Part 3, Part 4
2. MOHAMAD CHAHADEH: Part 1, Part 2a, Part 2b, Part 4
3. FITNETE GUNI: Part 2c, Part 4

1 Part 1

Implementing an n-bit Register, controlled using a 2-bit FunSel signal and an Enable signal. Figure 1 Shows the diagram and characteristic equation of Part 1.



E	FunSel	Q^+
0	ϕ	Q (retain value)
1	00	0 (Clear)
1	01	I (Load)
1	10	Q-1 (Decrement)
1	11	Q+1 (Increment)

Figure 1: Diagram and characteristic equation of Part 1

1.1 Implementation

the module implemented takes one parameter n, which is the number of bits of the register, a clock signal, two control inputs being FunSel and Enable, and one output of n-bits. the module is implemented by use the always block which executes on every positive edge of the clock, an if statement to check the enable signal, and a case block for the various inputs of FunSel. the following is the code for implementing the module.

```
module part1 #(parameter n = 4)
(input clk,
 input [1:0] FunSel,
 input [n-1:0] data_in,
 input enable,
 output reg [n-1:0] data_out);

    wire [n-1:0] zero = 0;
    always @(posedge clk)
    begin
        if (enable == 0)
            data_out <= data_out;
        else
            case (FunSel)
```

```
            2'b00: data_out <= zero;
            2'b01: data_out <= data_in;
            2'b10: data_out <= data_out - 1;
            2'b11: data_out <= data_out + 1;
        endcase
    end
endmodule
```

1.2 Simulation

Figure 2 Shows a simulation of the module implemented earlier of n = 4.

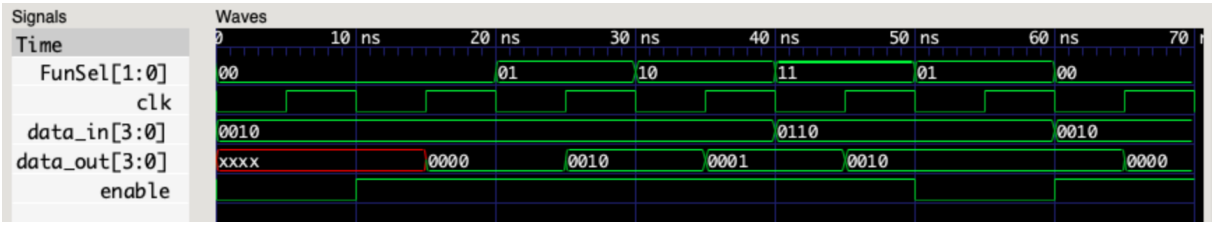
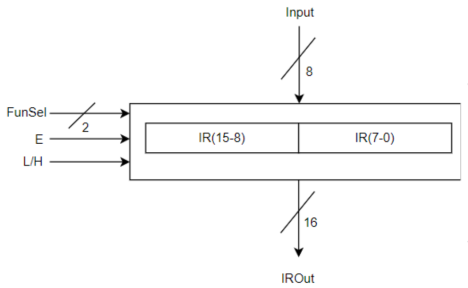


Figure 2: Simulation of Part 1, n-bit Register.

2 Part 2

2.1 Part 2a

Designing a 16-bit IR Register whose Diagram and Characteristic table is shown in Figure 3.



L'/H	E	FunSel	IR'
ϕ	0	ϕϕ	IR(Retain Value)
ϕ	1	00	0 (Clear)
0	1	01	IR(7-0) <- I (Load LSB)
1	1	01	IR(15-8) <- I (Load MSB)
ϕ	1	10	IR-1 (Decrement)
ϕ	1	11	IR+1(Increment)

Figure 3: Diagram and Characteristics of Part 2a