Computer Architecture , project B

Title : Car Parking System

Section : 4C2

Group number : 2

No.	**Name**	**Academic No.**	**Academic email**	**Work**
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Contents of the report :

The project aim :

We want to create a private parking that allows certain people to enter through the gate which has an entrance sensor that is activated by cars approaching the gate, the gate will ask for a password, afterwards if the LED light turns green it indicates that the password was entered correctly so the gate will open. However if the LED light turns red it refers to that the password was entered incorrectly so the gate will refuse to open. After the car enters the exit sensor will detect it and the gate will be locked,At the end the password monitor will reset to its main screen for the next car.

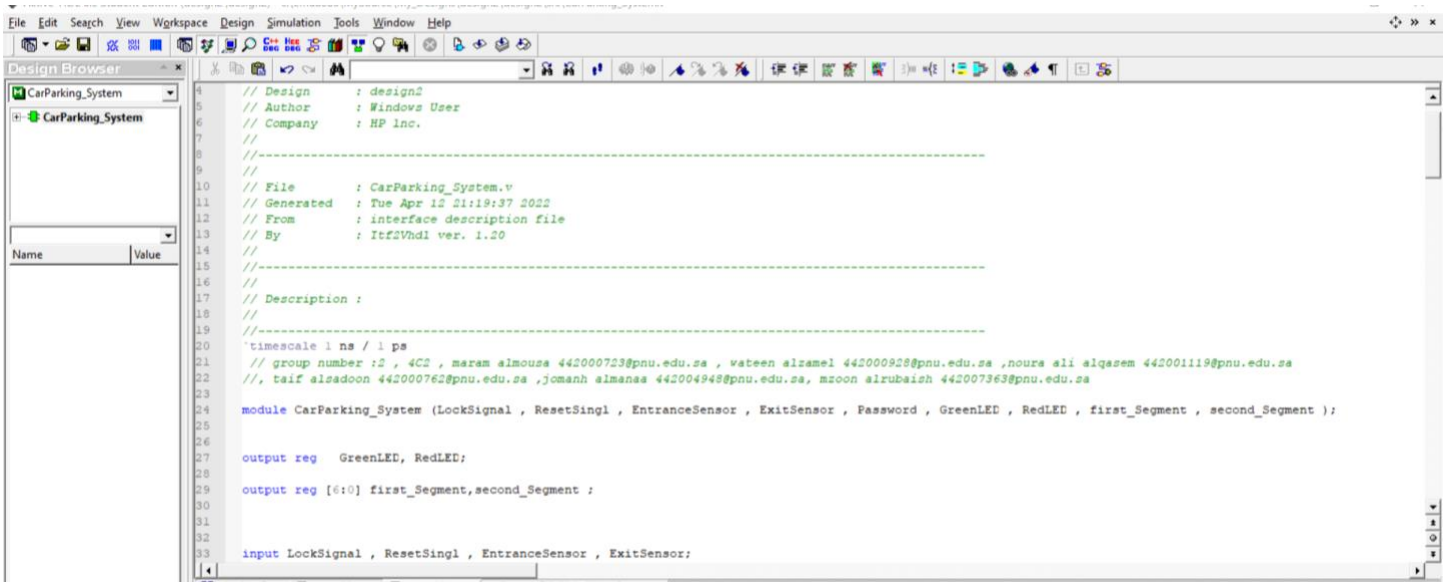
The input:

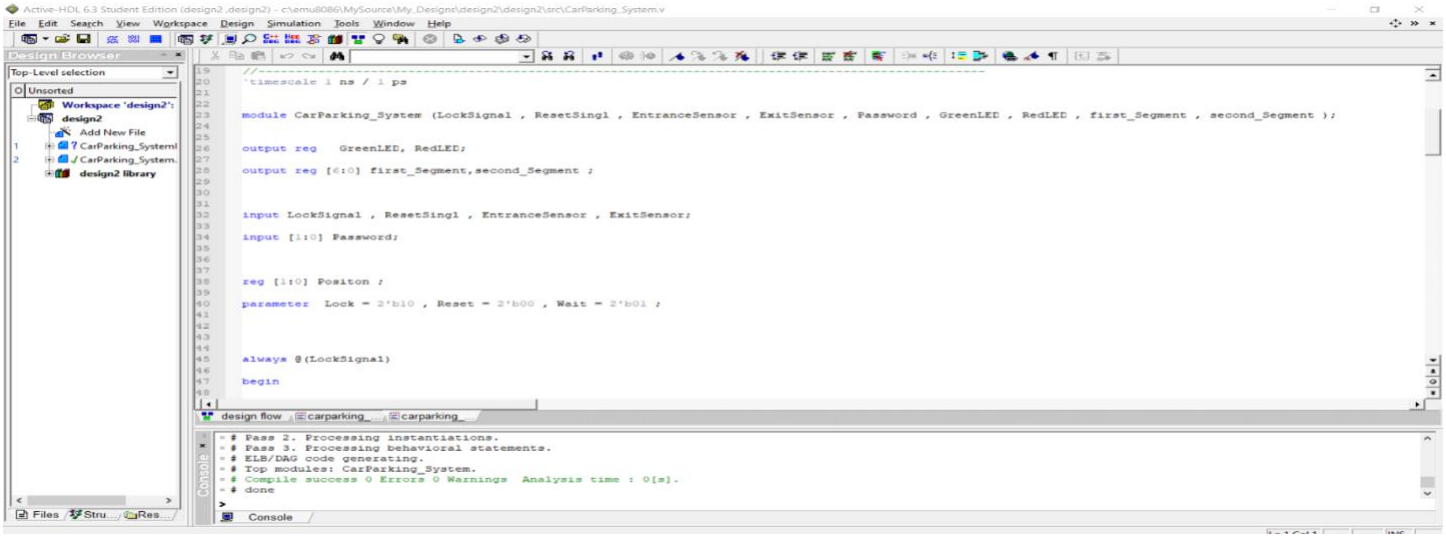
LockSignal , ResetSignal, EntranceSensor,ExitSensor and Password

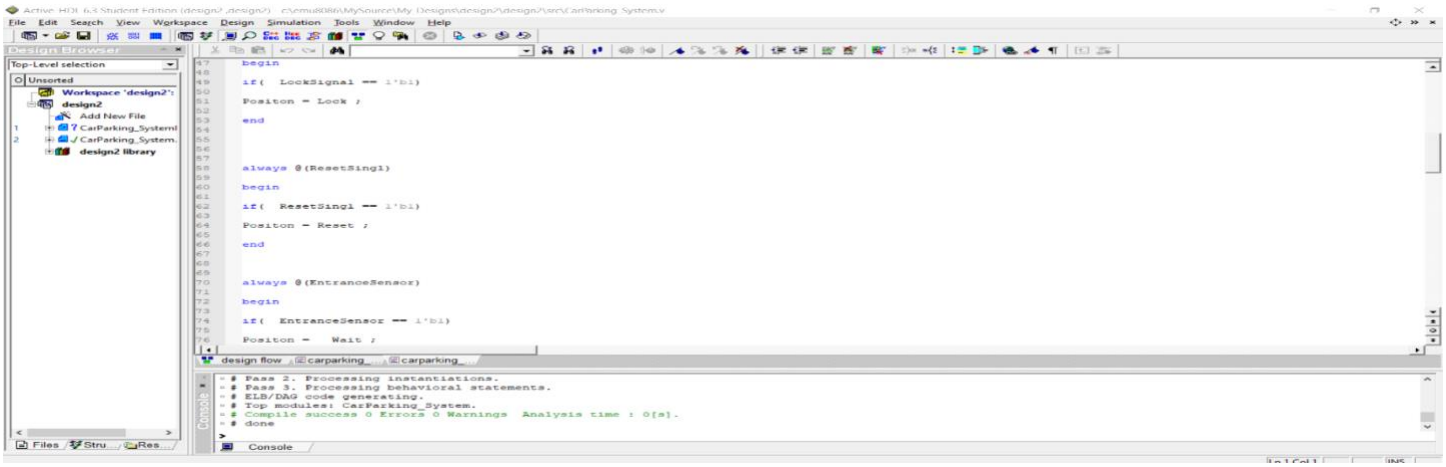
The output:

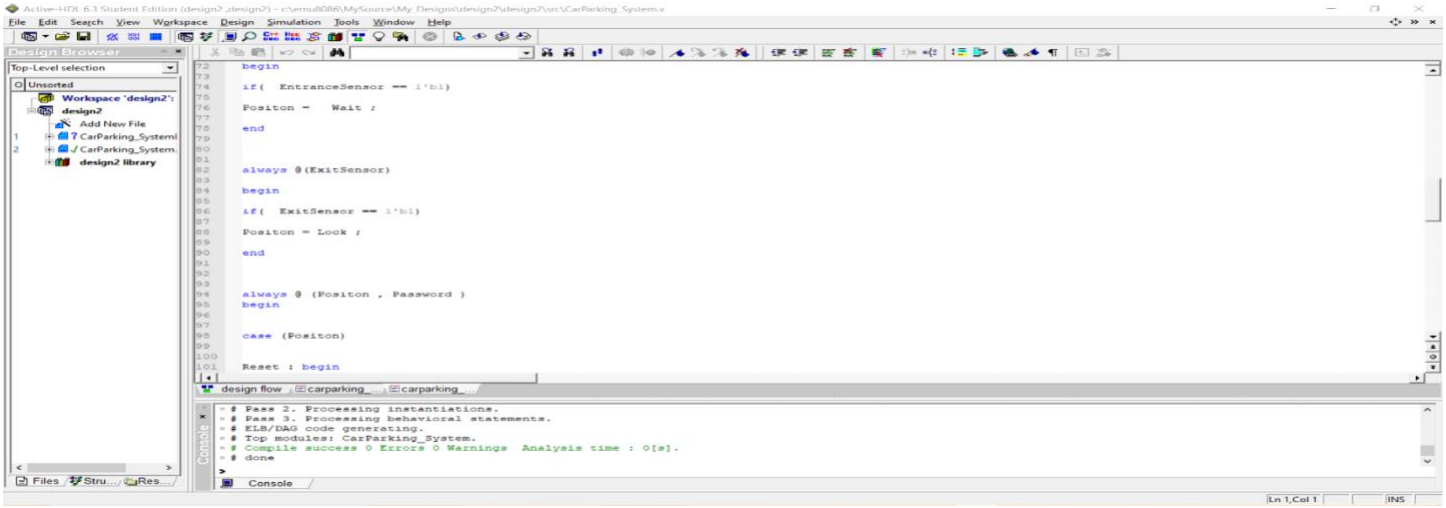
first_Segment,second_Segment , RedLED and GreenLED

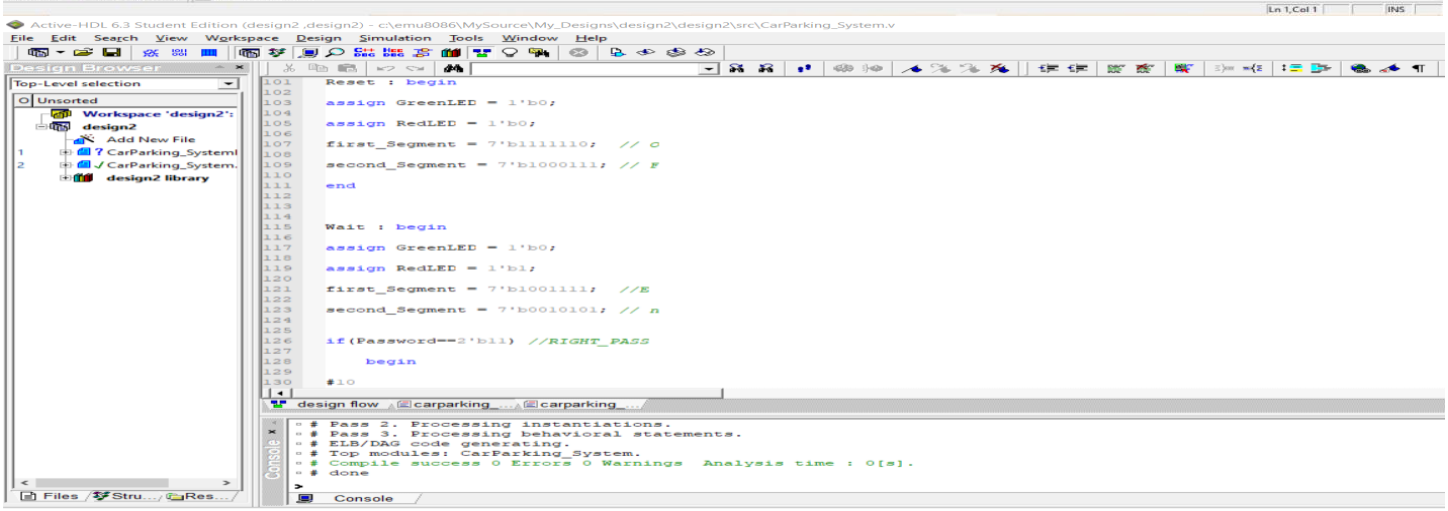
The problem solution :

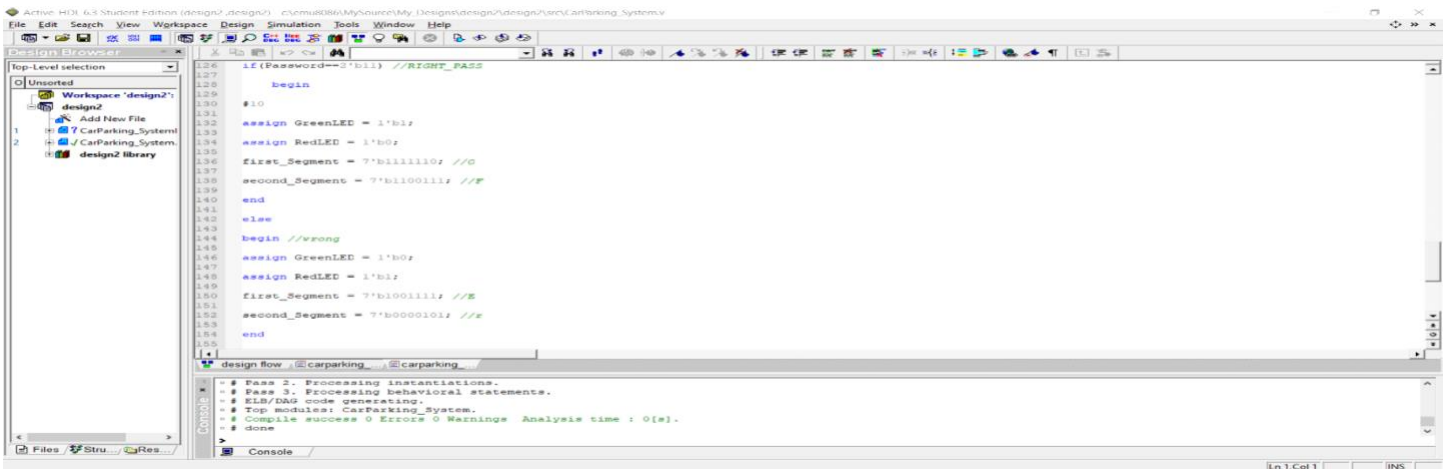



Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_System.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
Top-Level selection
Unsorted
Workspace 'design2';
design2
Add New File
CarParking_System
CarParking_System.
design2 library
`timescale 1 ns / 1 ps
module CarParking_System (LockSignal , ResetSingl , EntranceSensor , ExitSensor , Password , GreenLED , RedLED , first_Segment , second_Segment);
output reg GreenLED, RedLED;
output reg [6:0] first_Segment,second_Segment ;
input LockSignal , ResetSingl , EntranceSensor , ExitSensor;
input [1:0] Password;
reg [1:0] Positon ;
parameter Lock = 2'b10 , Reset = 2'b00 , Wait = 2'b01 ;
always @(LockSignal)
begin
design flow
carparking
carparking
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_System.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files
Stru...
Res...


Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_System.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
Top-Level selection
Unsorted
Workspace 'design2';
design2
Add New File
CarParking_System
CarParking_System.
design2 library
begin
if(LockSignal == 1'b1)
Positon = Lock ;
end
always @(ResetSingl)
begin
if(ResetSingl == 1'b1)
Positon = Reset ;
end
always @(EntranceSensor)
begin
if(EntranceSensor == 1'b1)
Positon = Wait ;
design flow
carparking
carparking
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_System.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files
Stru...
Res...


Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_System.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
Top-Level selection
Unsorted
Workspace 'design2':
design2
Add New File
CarParking_System
CarParking_System.
design2 library
begin
if(EntranceSensor == 1'b1)
Positon = Wait ;
end
always @(ExitSensor)
begin
if(ExitSensor == 1'b1)
Positon = Lock ;
end
always @ (Positon , Password)
begin
case (Positon)
Reset : begin
design flow
carparking
carparking
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_System.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files
Stru...
Res...
Ln 1,Col 1
INS


Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_System.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
Top-Level selection
Unsorted
Workspace 'design2':
design2
Add New File
CarParking_System
CarParking_System.
design2 library
Reset : begin
assign GreenLED = 1'b0;
assign RedLED = 1'b0;
first_Segment = 7'b1111110; // 0
second_Segment = 7'b1000111; // F
end
Wait : begin
assign GreenLED = 1'b0;
assign RedLED = 1'b1;
first_Segment = 7'b1001111; //E
second_Segment = 7'b0010101; // n
if(Password==2'b11) //RIGHT_PASS
begin
#10
design flow
carparking
carparking
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_System.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files
Stru...
Res...


Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_System.v
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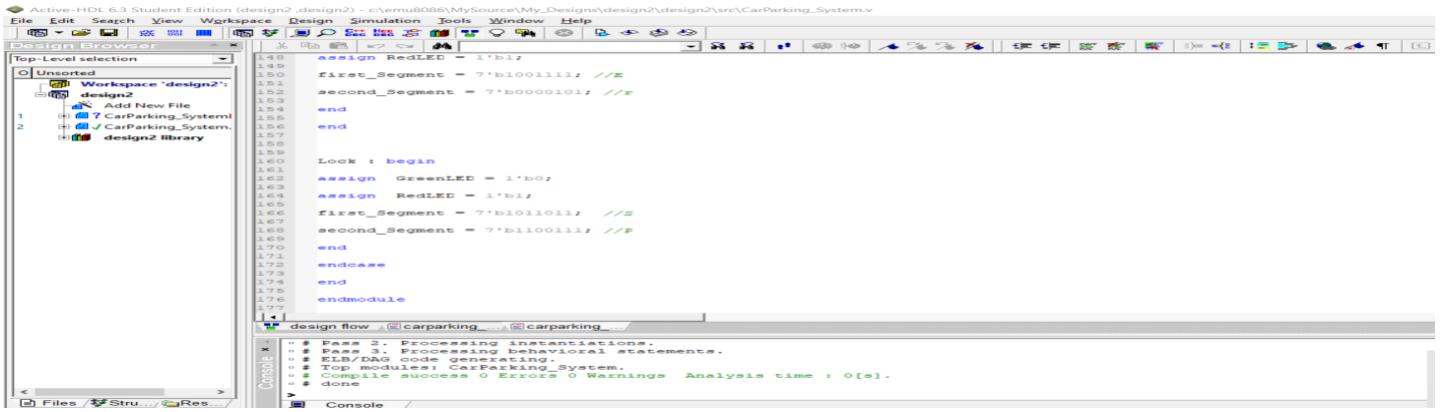
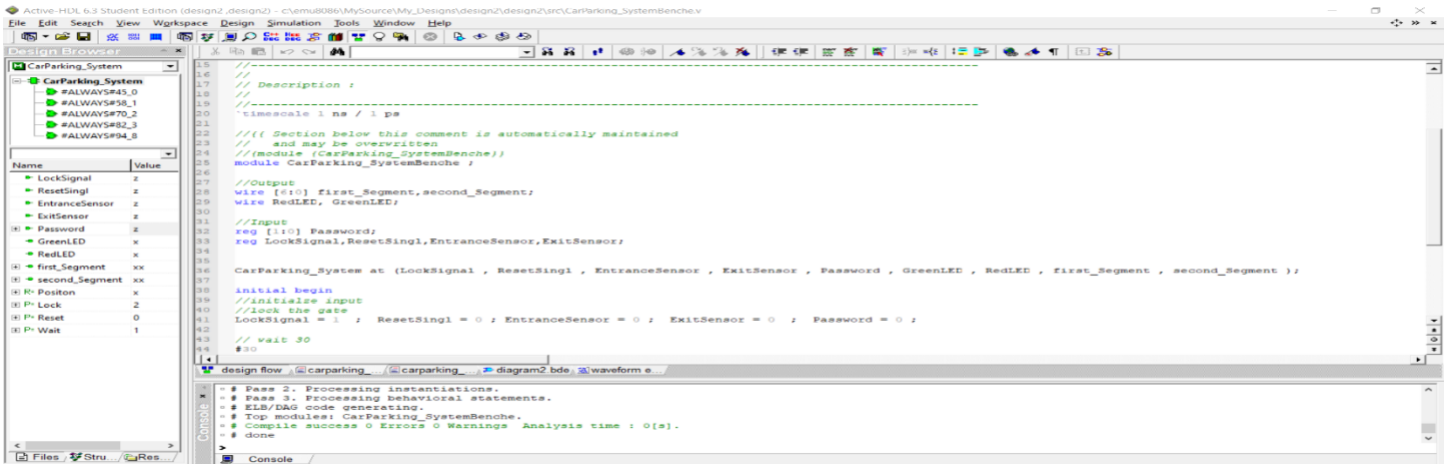
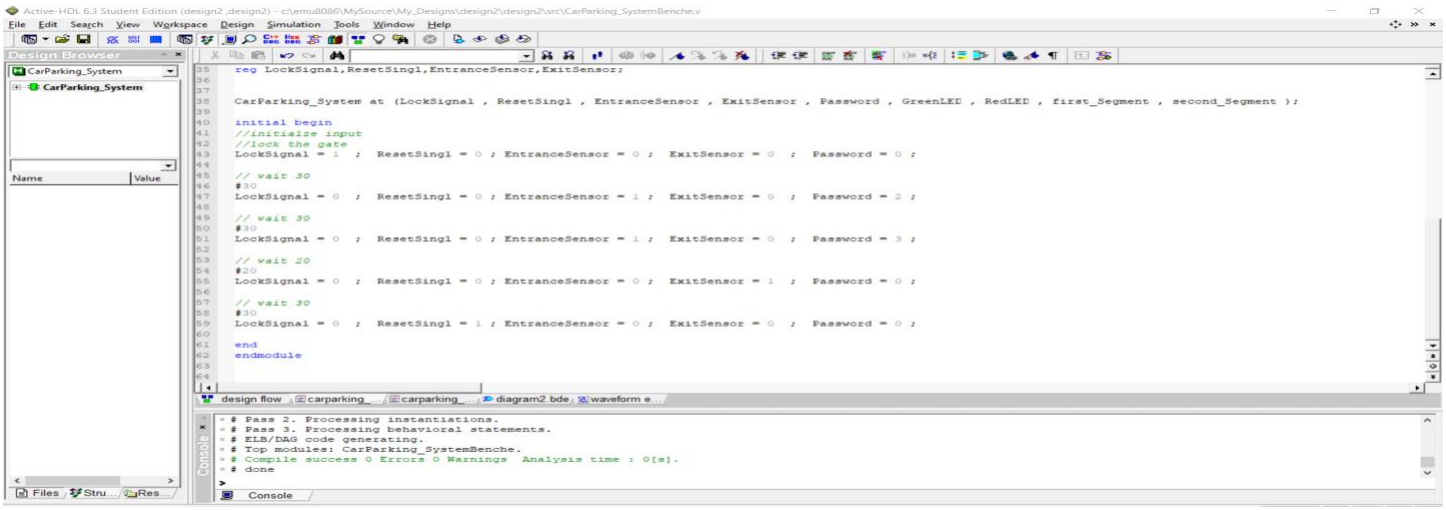
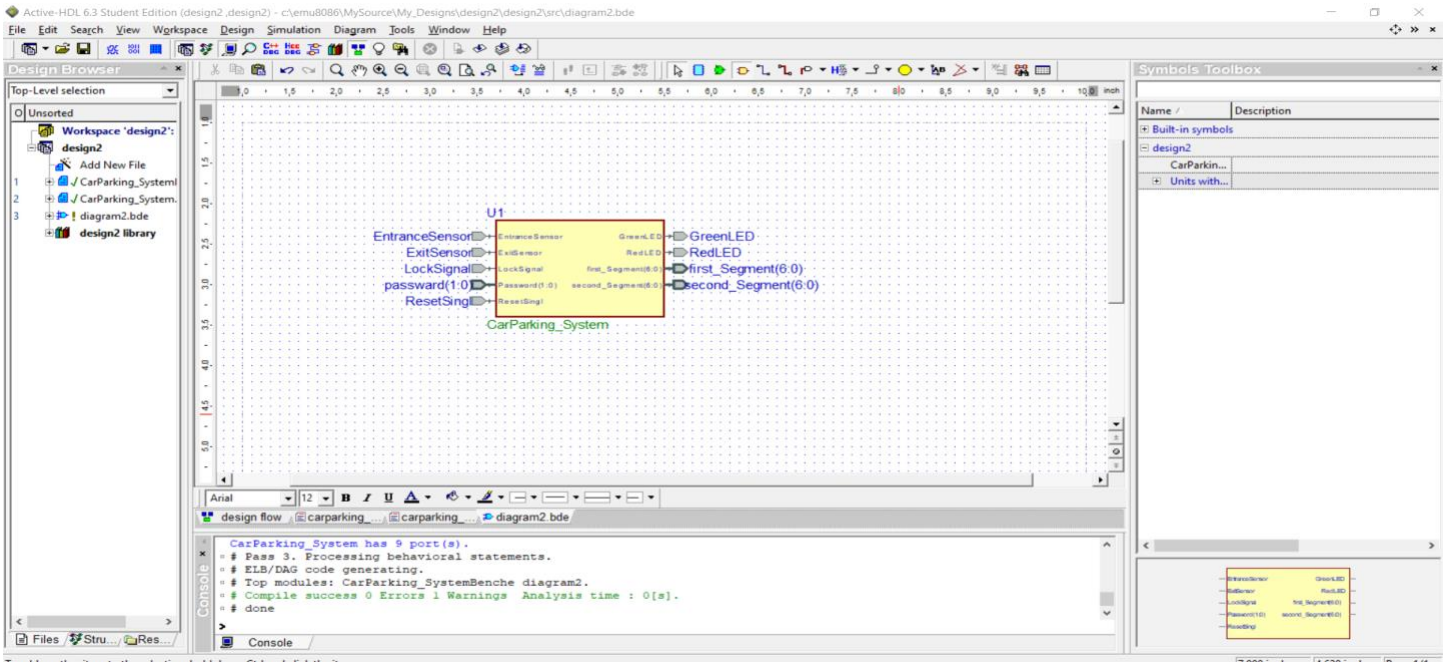
Design Browser
Top-Level selection
Unsorted
Workspace 'design2':
design2
Add New File
CarParking_System
CarParking_System.
design2 library
if(Password==2'b11) //RIGHT_PASS
begin
#10
assign GreenLED = 1'b1;
assign RedLED = 1'b0;
first_Segment = 7'b1111110; //0
second_Segment = 7'b1000111; //F
end
else
begin //wrong
assign GreenLED = 1'b0;
assign RedLED = 1'b1;
first_Segment = 7'b1001111; //E
second_Segment = 7'b0000101; //r
end
design flow
carparking
carparking
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_System.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files
Stru...
Res...
Ln 1,Col 1
INS

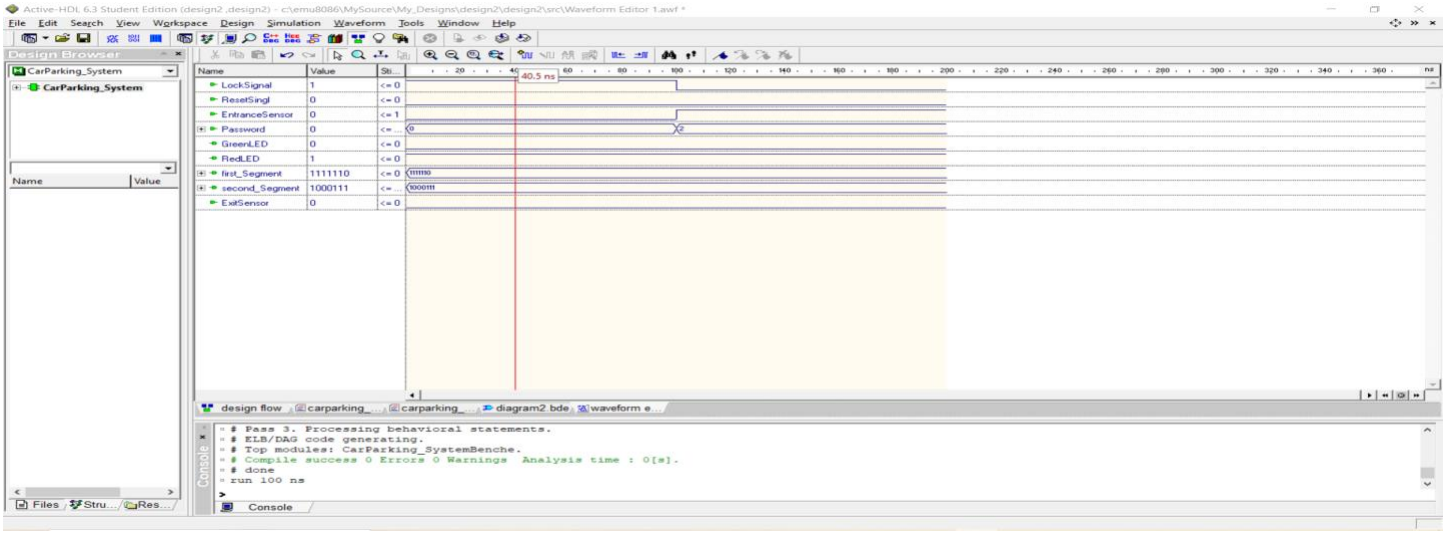

Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_System.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
Top-Level selection
Unsorted
Workspace 'design2':
design2
Add New File
CarParking_System
CarParking_System.
design2 library
assign RedLED = 1'b1;
first_Segment = 7'b1001111; //E
second_Segment = 7'b0000101; //r
end
end
Lock : begin
assign GreenLED = 1'b0;
assign RedLED = 1'b1;
first_Segment = 7'b1011011; //S
second_Segment = 7'b1100111; //P
end
endcase
end
endmodule
design flow
carparking
carparking
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_System.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files
Stru...
Res...


Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_SystemBenche.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
CarParking_System
#ALWAYS#45_0
#ALWAYS#58_1
#ALWAYS#70_2
#ALWAYS#82_3
#ALWAYS#94_8
Name Value
LockSignal z
ResetSingl z
EntranceSensor z
ExitSensor z
Password z
GreenLED x
RedLED x
first_Segment xx
second_Segment xx
Positon x
Lock 2
Reset 0
Wait 1
//
// Description :
//
`timescale 1 ns / 1 ps
//{{ Section below this comment is automatically maintained
// and may be overwritten
//{module {CarParking_SystemBenche}}
module CarParking_SystemBenche ;
//Output
wire [6:0] first_Segment,second_Segment;
wire RedLED, GreenLED;
//Input
reg [1:0] Password;
reg LockSignal,ResetSingl,EntranceSensor,ExitSensor;
CarParking_System at (LockSignal , ResetSingl , EntranceSensor , ExitSensor , Password , GreenLED , RedLED , first_Segment , second_Segment);
initial begin
//initialze input
//lock the gate
LockSignal = 1 ; ResetSingl = 0 ; EntranceSensor = 0 ; ExitSensor = 0 ; Password = 0 ;
// wait 30
#30
design flow carparking_ carparking_ diagram2.bde waveform e
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_SystemBenche.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files Stru... Res...


Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\CarParking_SystemBenche.v
File Edit Search View Workspace Design Simulation Tools Window Help
Design Browser
CarParking_System
Name Value
reg LockSignal,ResetSingl,EntranceSensor,ExitSensor;
CarParking_System at (LockSignal , ResetSingl , EntranceSensor , ExitSensor , Password , GreenLED , RedLED , first_Segment , second_Segment);
initial begin
//initialze input
//lock the gate
LockSignal = 1 ; ResetSingl = 0 ; EntranceSensor = 0 ; ExitSensor = 0 ; Password = 0 ;
// wait 30
#30
LockSignal = 0 ; ResetSingl = 0 ; EntranceSensor = 1 ; ExitSensor = 0 ; Password = 2 ;
// wait 30
#30
LockSignal = 0 ; ResetSingl = 0 ; EntranceSensor = 1 ; ExitSensor = 0 ; Password = 3 ;
// wait 20
#20
LockSignal = 0 ; ResetSingl = 0 ; EntranceSensor = 0 ; ExitSensor = 1 ; Password = 0 ;
// wait 30
#30
LockSignal = 0 ; ResetSingl = 1 ; EntranceSensor = 0 ; ExitSensor = 0 ; Password = 0 ;
end
endmodule
design flow carparking_ carparking_ diagram2.bde waveform e
Pass 2. Processing instantiations.
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_SystemBenche.
Compile success 0 Errors 0 Warnings Analysis time : 0[s].
done
Console
Files Stru... Res...

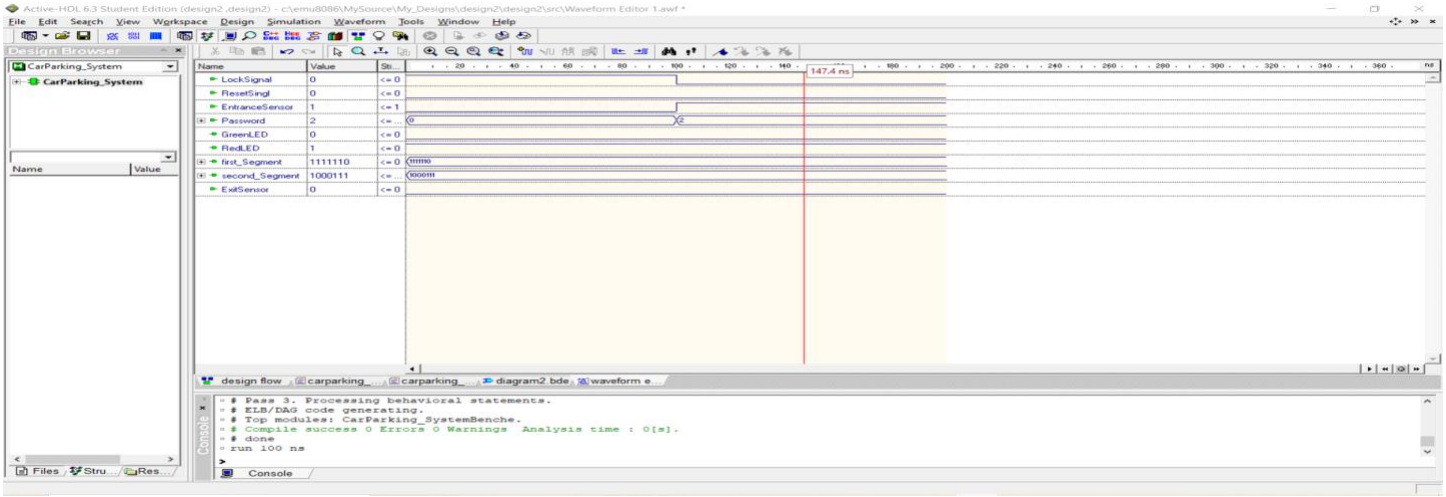

Active-HDL 6.3 Student Edition (design2 ,design2) - c:\emu8086\MySource\My_Designs\design2\design2\src\diagram2.bde
File Edit Search View Workspace Design Simulation Diagram Tools Window Help
Design Browser
Top-Level selection
Unsorted
Workspace 'design2':
design2
Add New File
1 CarParking_Systeml
2 CarParking_System.
3 diagram2.bde
design2 library
Symbols Toolbox
Name / Description
Built-in symbols
design2
CarParkin...
Units with...
U1
EntranceSensor
ExitSensor
LockSignal
password(1:0)
ResetSingl
GreenLED
RedLED
first_Segment(6:0)
second_Segment(6:0)
CarParking_System
design flow carparking_ carparking_ diagram2.bde
CarParking_System has 9 port(s).
Pass 3. Processing behavioral statements.
ELB/DAG code generating.
Top modules: CarParking_SystemBenche diagram2.
Compile success 0 Errors 1 Warnings Analysis time : 0[s].
done
Console
Files Stru... Res...

The first scenario:



When the Lock_Signal equals one then the GreenLED will equal zero and the RedLED will equal one and the first segment will equal 1111110 and the second segment will equal 1000111

The second scenario :



When the Lock_Signal equals zero then the GreenLED will equal zero and the RedLED will equal one and the first segment will equal 1111110 and the second segment will equal 1000111

Solution code :

```
// group number :2 , 4C2 , maram almousa 442000723@pnu.edu.sa , wateen alzamel 442000928@pnu.edu.sa ,noura ali alqasem 442001119@pnu.edu.sa

//, taif alsadoon 442000762@pnu.edu.sa ,jomanh almanaa 442004948@pnu.edu.sa, mzoon alrubaish 442007363@pnu.edu.sa

module CarParking_System (LockSignal , ResetSingl , EntranceSensor , ExitSensor , Password , GreenLED , RedLED , first_Segment , second_Segment );

output reg   GreenLED, RedLED;

output reg [6:0] first_Segment,second_Segment ;

input LockSignal , ResetSingl , EntranceSensor , ExitSensor;

input [1:0] Password;

reg [1:0] Positon ;

parameter  Lock = 2'b10 , Reset = 2'b00 , Wait = 2'b01 ;

always @(LockSignal)

begin

if(  LockSignal == 1'b1)

 Positon = Lock ;

end

always @(ResetSingl)

begin

if(  ResetSingl == 1'b1)

Positon = Reset ;

end

always @(EntranceSensor)

begin

if(  EntranceSensor == 1'b1)

Positon =   Wait ;

end

always @(ExitSensor)

begin

if(  ExitSensor == 1'b1)

Positon = Lock ;

end

always @ (Positon , Password )

begin
```

```
case (Positon)
Reset : begin
assign GreenLED = 1'b0;
assign RedLED = 1'b0;
first_Segment = 7'b1111110;  // O
second_Segment = 7'b1000111; // F
end
Wait : begin
assign GreenLED = 1'b0;
assign RedLED = 1'b1;
first_Segment = 7'b1001111;  //E
second_Segment = 7'b0010101; // n
if(Password==2'b11) //RIGHT_PASS              begin          #10
assign GreenLED = 1'b1;
assign RedLED = 1'b0;
first_Segment = 7'b1111110; //O
second_Segment = 7'b1100111; //F
end
 else
begin //wrong
assign GreenLED = 1'b0;
assign RedLED = 1'b1;
first_Segment = 7'b1001111;          //E
second_Segment = 7'b0000101; //r
end
end
Lock : begin
assign    GreenLED = 1'b0;
assign  RedLED = 1'b1;
first_Segment = 7'b1011011;          //S
second_Segment = 7'b1100111; //P
end
endcase           end
endmodule
```

the testbenches code :

```
module CarParking_SystemBenche

//Output

wire [6:0] first_Segment,second_Segment;

wire RedLED, GreenLED;

//Input

reg [1:0] Password;

reg LockSignal,ResetSingl,EntranceSensor,ExitSensor;

CarParking_System at (LockSignal , ResetSingl , EntranceSensor , ExitSensor , Password , GreenLED , RedLED , first_Segment , second_Segment );

initial begin

//initialze input

//lock the gate

LockSignal = 1  ;  ResetSingl = 0 ; EntranceSensor = 0 ;  ExitSensor = 0  ;  Password = 0 ;


// wait 30

#30

LockSignal = 0  ;  ResetSingl = 0 ; EntranceSensor = 1 ;  ExitSensor = 0  ;  Password = 2 ;


// wait 30

#30

LockSignal = 0  ;  ResetSingl = 0 ; EntranceSensor = 1 ;  ExitSensor = 0  ;  Password = 3 ;


// wait 20

#20

LockSignal = 0  ;  ResetSingl = 0 ; EntranceSensor = 0 ;  ExitSensor = 1  ;  Password = 0 ;


// wait 30

#30

LockSignal = 0  ;  ResetSingl = 1 ; EntranceSensor = 0 ;  ExitSensor = 0  ;  Password = 0 ;


end

endmodule
```

References :

The fifth edition of computer organization and design

Computer Organization and Architecture

https://verificationguide.com/systemverilog/systemverilog-program-block/