# CS223 project

# Interface description of ready modules

module keypad4X4(

input clk,

output [3:0] keyb\_row,

input [3:0] keyb\_col,

output [3:0] key\_value,

output key\_valid

)

* clk : BASYS-3 system clock (100Mhz).
* keyb\_row, keyb\_col : Using these ports, SystemVerilog module is connected to physical keypad. Then you need to connect them to FPGA pins. Refer to example\_project\_1 to see which FPGA pins to use.
* key\_value, key\_valid : you use these ports inside your design. When any key of pinpad is pressed for long enough time, key\_valid becomes '1' for just one clock cycle. At the same time, the value of key\_value holds the code of the pressed key ( {row[1:0], col[1:0]} ).

module SevSeg\_4digit(

input clk,

input [3:0] in0, in1, in2, in3,

output a, b, c, d, e, f, g, dp,

output [3:0] an

)

* clk : BASYS-3 system clock (100Mhz).
* in0, in1, in2, in3: These four hex numbers are set by user and then are displayed on 7-segment.
* a, b, c, d, e, f, g, dp, an : Using these pins, SystemVerilog module is connected to physical 7-segment. Then you need to connect them to FPGA pins. Refer to example\_project\_1 to see which FPGA pins to use.

module stepmotor(

input clk,

input direction,

input [1:0] speed,

output [3:0] phases,

input stop

);

* You do not use this module directly. You use “steppermotor\_wrapper.sv” and that module uses “stepmotor.sv”.

module steppermotor\_wrapper (

input clk,

input [1:0] direction,

input [1:0] rotation\_duration,

output [3:0] phases,

input start

);

* clk : BASYS-3 system clock (100Mhz).
* Direction : user input for motor rotation directions. Direction[0] is direction of first movement and direction[1] is direction of second movement. ‘0’ value is left and ‘1’ value means right.
* rotation\_duration: user input for motor rotation duration. Rotation\_duration[0] is duration of first movement and rotation\_duration[1] is duration of second movement. ‘0’ value is short and ‘1’ value is long.
* phases: Using these ports SystemVerilog module is connected to motor. Then you need to connect them to FPGA pins. Refer to example\_project\_2 to see to which FPGA pins they should connect.
* Start: user input to initiate motor movement. A pulse (at least one clock cycle) starts 2 movements of motor to represent a code. Direction and duration of both movements are captured together at the time of applying start command. If you re-apply start or change the value of direction/durations before end of both movements, they are ignored. To play each code, you need to assign correct values of direction/duration from mapping table to inputs. Then apply start command.