```
1   `timescale 1ns / 1ps
2   /**********************************************************************
3    * File Name: hex_to_7seg.v
4    * Project: Counter using AISO
5    * Designer: Marc Cabote
6    * Email: marcdominic011@gmail.com
7    * Rev. Date: 20 September 2017
8    *
9    * Purpose: The Hex-to-7-Segment module is a combinational logic circuit designed
10   *          to convert a 4-bit hexidecimal input value into a 7-bit 7-segment output.
11   *          The various cathodes represent the seven segments of a single anode on the
12   *          Nexys4 DDR 7-segment display. If a cathode is set to 1'b0, its
     corresponding
13   *          segment will turn on. If a cathode is set to 1'b1, its corresponding
     segment
14   *          will turn off.
15   *
16   * Notes:   - Each segment in the LED 7-segment diplay is represented by letters a-g.
17   *          - A segment will turn on if its cathode has a lower value than its anode.
18   **********************************************************************/
19  module hex_to_7seg(input      [3:0] hex,
20                     output reg       a, b, c, d, e, f, g
21                     );
22
23     // Execute block if hex changes
24     always @( hex ) begin
25        case( hex )
26           4'b0000: {a, b, c, d, e, f, g} = 7'b0000001; // 7-segment code for 0
27           4'b0001: {a, b, c, d, e, f, g} = 7'b1001111; // 7-segment code for 1
28           4'b0010: {a, b, c, d, e, f, g} = 7'b0010010; // 7-segment code for 2
29           4'b0011: {a, b, c, d, e, f, g} = 7'b0000110; // 7-segment code for 3
30           4'b0100: {a, b, c, d, e, f, g} = 7'b1001100; // 7-segment code for 4
31           4'b0101: {a, b, c, d, e, f, g} = 7'b0100100; // 7-segment code for 5
32           4'b0110: {a, b, c, d, e, f, g} = 7'b0100000; // 7-segment code for 6
33           4'b0111: {a, b, c, d, e, f, g} = 7'b0001111; // 7-segment code for 7
34           4'b1000: {a, b, c, d, e, f, g} = 7'b0000000; // 7-segment code for 8
35           4'b1001: {a, b, c, d, e, f, g} = 7'b0000100; // 7-segment code for 9
36           4'b1010: {a, b, c, d, e, f, g} = 7'b0001000; // 7-segment code for A
37           4'b1011: {a, b, c, d, e, f, g} = 7'b1100000; // 7-segment code for B
38           4'b1100: {a, b, c, d, e, f, g} = 7'b0110001; // 7-segment code for C
39           4'b1101: {a, b, c, d, e, f, g} = 7'b1000010; // 7-segment code for D
40           4'b1110: {a, b, c, d, e, f, g} = 7'b0110000; // 7-segment code for E
41           4'b1111: {a, b, c, d, e, f, g} = 7'b0111000; // 7-segment code for F
42           default: {a, b, c, d, e, f, g} = 7'b1111111; // Default Case
43        endcase
44     end
45
46  endmodule
47
```