**Name:**_____ **Section:** ○ M1 ○ T1

## Homework Assignment: Submit via gradescope

1. In this problem, you will build a VHDL entity called **scancode decoder** which processes keyboard scancodes. When you press a key on a keyboard, the keyboard sends an 8-bit code to the computer called a PS2 scancode. Each key has its own scancode listed below. The relationship between the keys and their scancode is not based on ASCII nor any other discernible pattern.

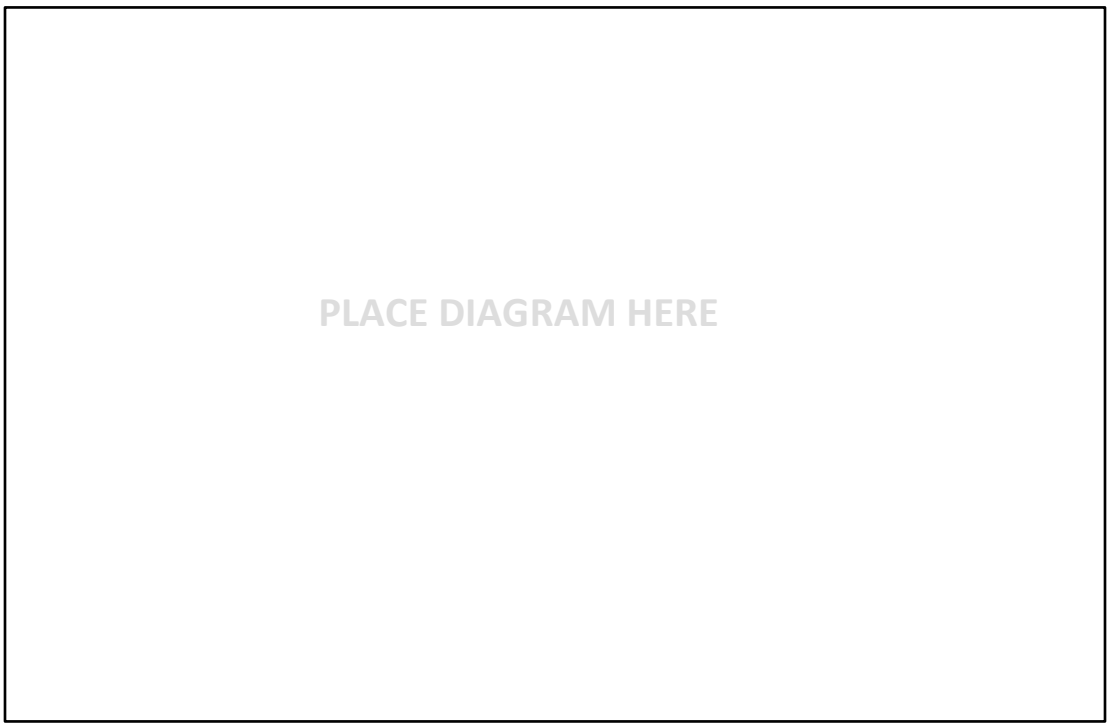
| **Keyboard Key** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scancode (in hex)** | 0x45 | 0x16 | 0x1E | 0x26 | 0x25 | 0x2E | 0x36 | 0x3D | 0x3E | 0x46 |

Build a component which converts an 8-bit scancode for the digits 0-9 into a 4-bit hexadecimal values.

| **Nomenclature:** | **Scancode decoder** |
|---|---|
| **Data Input:** | D = std_logic_vector(7 downto 0); |
| **Data Output:** | H = std_logic_vector(3 downto ); |
| **Control:** | none |
| **Status:** | none |
| **Behavior:** | Converts the scancode D, representing a keypress of a decimal digit, into its 4-bit value. For example, if D = $25_{16}$, the scancode for the character "4", then the converter should output H = $0100_2$. Assume that the inputs are always legal hexadecimal scancodes. |

Use the ***when*** statement syntax to describe the output in terms of the input.

a. Create a testbench to simulate and demonstrate your function works for all 10 values in the first table. Provide a cropped screenshot of the resulting simulation timing diagram below - make the signal values legible.




b. In Github, provide the VHDL code for your **Scancode decoder** component and testbench.