**Ex 1:**

**Table 1.**

|  |  |
| --- | --- |
| **Counter implementation** | **Number of LEs** |
| Original if-else Structure | **19** |
| Modified if-else Structure | **9** |

**Ex 2:**

**Table 2.**

|  |  |
| --- | --- |
| **Counter implementation** | **Number of ALUTs** |
| Original 16-bit counter | **8** |
| Modulus-100 counter | **15** |

**Ex 3:** # of ALUTs (default encoding) : \_\_\_\_**9**\_\_\_\_\_\_\_

# of registers (default encoding): \_\_\_\_**10**\_\_\_\_\_\_

# of ALUTs (minimal bit encoding) : \_\_\_\_\_**8**\_\_\_\_\_

# of registers (default encoding): \_\_\_\_**4**\_\_\_\_\_\_

# of ALUTs (user encoding) : \_\_\_\_**6**\_\_\_\_

# of registers (user encoding): \_\_\_\_**5**\_\_\_\_\_\_

**Table 3**.

|  |  |  |
| --- | --- | --- |
| State name | Default encoding | Minimal bits |
| idle | **0000000000** | **0000** |
| header\_wait | **0000000011** | **0001** |
| got\_header | **0000000101** | **0010** |
| A1 | **0000001001** | **0011** |
| A2 | **0000010001** | **0111** |
| A3 | **0000100001** | **0101** |
| B1 | **0001000001** | **0110** |
| B2 | **0010000001** | **1010** |
| B3 | **0100000001** | **1101** |
| recover | **1000000001** | **0100** |

**Table 4.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***State*** | ***data\_a*** | ***data\_b*** | ***validate*** | ***error*** | ***Encoding*** |
| ***idle*** | **0** | **0** | **0** | **0** | **00000** |
| ***header\_wait*** | **0** | **0** | **1** | **0** | **00100** |
| ***got\_header*** | **0** | **0** | **0** | **0** | **00001** |
| ***a1*** | **1** | **0** | **0** | **0** | **10000** |
| ***a2*** | **1** | **0** | **0** | **0** | **10001** |
| ***a3*** | **1** | **0** | **1** | **0** | **10100** |
| ***b1*** | **0** | **1** | **0** | **0** | **01000** |
| ***b2*** | **0** | **1** | **0** | **0** | **01001** |
| ***b3*** | **0** | **1** | **1** | **0** | **01100** |
| ***recover*** | **0** | **0** | **0** | **1** | **00010** |