Experiment-5: Tone-Generation

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## Overview of the experiment:

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| In this experiment, we were supposed to design a logical circuit in behavioural VHDL which would use a 50 MHz on-board clock and a speaker circuit to generate the 8 Indian classical musical tones, each mapped to one switch and one led on the Krypton board. |

## Approach to the experiment:

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| To divide the given on-board clock for generting the desired frequency signal, we use a counter to count to a specific value and then complement the output signal after the count reaches the certain value and starts counting again.  The count formula is given by: |

## Design document and VHDL code if relevant:

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| toneGenerator: It takes the 50MHz clock signal, and switch state as the input and outputs the state of LEDs and the tone signal. It is written in a behavioural architecture. Each time a clock event occurs, or the switch state changes, it processes the inputs again. If no key, or more than 1 keys are pressed, then it ensures that no LED is turned on and no tone is generated.  Snippet of generating “Ga” when switch 3 is turned on:  --Ga  elsif(switch="00000100") then    if (count\_ga = 83333) then --300Hz  count\_ga := 1;  ga := not ga;  else  count\_ga := count\_ga + 1;  end if;  toneOut <= ga;  LED <= (2 => '1', others => '0'); |

## RTL View:

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## DUT Input/Output Format:

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| For this experiment, a new Testbench had to be generated. There was no DUT. The testbench inputted 2 signals “switch” and “clk”  Clk: imitating the role of the 50 MHz clock signal available on-board.  Switch: std\_logic\_vector of 8 bits, with only one bit set at a time. <s7s6s5s4s3s2s1s0> |

## RTL Simulation:

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## Gate-level Simulation:

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## Krypton board\*:

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## Observations\*:

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| On switching any one key at a time, the corresponding tone was emitted on the speaker and the corresponding LED started to glow. If more than 1 switch was turned on, then no tone was generated and all LEDs were switched off. |

## References:

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| Nil |

\* To be submitted after the tutorial on ”Using Krypton.