**Experiment No. : 7**

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**AIM**:The objective of this experiment is to get familiar with the use of the following features of a microcontroller: Interrupt, Timer, DAC and ADC. A triangular waveform having frequency adjustable through a Timer will be generated at the output of a DAC through a programme triggered by an Interrupt from a Timer. Another Timer will then be used to sample the triangular waveform and an ADC used to convert these samples back to Digital. Configurable interconnections among the microcontroller peripherals will be utilised to set up the whole system.

# OBSERVATIONS –

# PART A: Generation of Triangular Waveform by DAC triggered by a Timer

# DAC OUTPUT WAVEFORMS:-

# NA = 4

# 

# NA = 9

# 

# NA = 19

# 

# NA =39

# 

# PART B: Sampling the Triangular Waveform by ADC triggered by a Timer

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ARR(NA) = 9 | | | | | | ARR(NA) = 19 | | | | | | ARR(NA) = 39 | | | | | |
| **1st cycle** | | | 2nd cycle | | | 1st cycle | | | 2nd cycle | | | 1st cycle | | | 2nd cycle | | |
| **DAC in** | ADC out | Error | DAC in | ADC out | Error | DAC in | ADC out | Error | DAC in | ADC out | Error | DAC in | ADC out | Error | DAC in | ADC out | Error |
| **0** | 9 | -9 | 0 | 10 | -10 | 0 | 17 | -17 | 0 | 12 | -12 | 0 | 12 | -12 | 0 | 15 | -15 |
| **256** | 190 | 66 | 256 | 196 | 60 | 256 | 194 | 62 | 256 | 195 | 61 | 256 | 0 | 256 | 256 | 0 | 256 |
| **512** | 453 | 59 | 512 | 448 | 64 | 512 | 460 | 52 | 512 | 460 | 52 | 512 | 462 | 50 | 512 | 442 | 70 |
| **768** | 718 | 50 | 768 | 712 | 56 | 768 | 705 | 63 | 768 | 717 | 51 | 768 | 720 | 48 | 768 | 722 | 46 |
| **1024** | 990 | 34 | 1024 | 984 | 40 | 1024 | 983 | 41 | 1024 | 983 | 41 | 1024 | 979 | 45 | 1024 | 982 | 42 |

# Computing the average errors, we find that we obtain the minimum error for ARR = 19.

# RESULTS:

# In part A, the DAC output waveforms obtained are triangular in shape for all the ARRs (NA) for which the waveforms were generated.

# In part B, upon tabulating the DAC inputs and ADC outputs and the errors, we obtained minimum error for ARR = 19.