

EEE/EIE Year 1 – Signals and Scope Experiment Solutions

Test 1 – Triangular signal with DC offset

- Expand both X and Y to reveal quantization on amplitude and sampling in time
- Offset voltage = 2.18 V
- Pk-to-Pk triangular signal = 0.49 V
- Amplitude quantization step = 8 mV

Magic No	Parameters
1	Frequency of triangular wave = 5000 Hz Sample period = 1.6 microsec
2	Frequency of triangular wave = 6250 Hz Sample period = 1.2 microsec
3	Frequency of triangular wave = 7500 Hz Sample period = 1.0 microsec
4	Frequency of triangular wave = 8750 Hz Sample period = 0.9 microsec
5	Frequency of triangular wave = 10000 Hz Sample period = 0.8 microsec
6	Frequency of triangular wave = 11250 Hz Sample period = 0.7 microsec
7	Frequency of triangular wave = 12500 Hz Sample period = 0.6 microsec
8	Frequency of triangular wave = 13750 Hz Sample period = 0.6 microsec

Test 2 – Burst of eight 40kHz digital pulses

- CH 1 - This is a trigger pulse repeated every 1.58 msec , pulse width = 96 μ sec
- CH 2 - Burst of 8 pulses with width of about 45 μ sec
- Delay between trigger signal rising edge and start of digital burst is around 180-220 μ sec
- Same for all Black Boards

Test 3 – Exponential rise and fall signal

- Exponential rise and fall between 0V and 3.85V
- Frequency = 1100 Hz

Magic No	Parameters
1	Time constant = 64 μ sec
2	Time constant = 70 μ sec
3	Time constant = 76 μ sec
4	Time constant = 83 μ sec
5	Time constant = 89 μ sec
6	Time constant = 95 μ sec
7	Time constant = 102 μ sec
8	Time constant = 108 μ sec

Test 4 – Digital Square Signal

- A digital square wave between 0 and 3.3V at 4MHz
- CH1 x10 probe rise time = 3.8ns
- CH2 x1 probe rise time = 22ns

Test 5 – Sinewave with random noise added

- Sinewave frequency = 200 Hz
- Sinewave pk-pk voltage = 2V

Magic No	Parameters
1	Noise pk-pk amplitude = 0.8 V
2	Noise pk-pk amplitude = 0.9 V
3	Noise pk-pk amplitude = 1.0 V
4	Noise pk-pk amplitude = 1.0 V
5	Noise pk-pk amplitude = 1.1 V
6	Noise pk-pk amplitude = 1.2 V
7	Noise pk-pk amplitude = 1.3 V
8	Noise pk-pk amplitude = 1.4 V

Test 6 – Pulse width modulated (PWM) signal

- Duty cycle varies from 0% to 100%
- Test Pin 5 (black) output is DC varying from 0V to 3.3V

Test 7 – UART sequence (hash-tag)

Magic No	Parameters
1	#DOG
2	#CAT
3	#FOG
4	#HAT
5	#LOG
6	#FAT
7	#MOB
8	#SAD

Test 8 – Two sinewaves with relative phase shift

- Sinewaves both at 14Hz
- Note that 360 degree = 0 degree due to the wraparound effect of phase in a sinewave
- Similarly, 405 degree = 45 degree

Magic No	Parameters
1	Minimum phase shift = 0 degrees Maximum phase shift = 90 degrees
2	Minimum phase shift = 45 degrees Maximum phase shift = 135 degrees
3	Minimum phase shift = 90 degrees Maximum phase shift = 180 degrees
4	Minimum phase shift = 135 degrees Maximum phase shift = 225 degrees
5	Minimum phase shift = 180 degrees Maximum phase shift = 270 degrees
6	Minimum phase shift = 225 degrees Maximum phase shift = 315 degrees
7	Minimum phase shift = 270 degrees Maximum phase shift = 360 degrees
8	Minimum phase shift = 315 degrees Maximum phase shift = 405 degrees