The step numbers in this data sheet refer to those in the laboratory exercise instructions.

Step 2:

Table 1. Differentiator input and output waveform descriptions

|  |  |  |
| --- | --- | --- |
| Input Waveform Description | Output Waveform Description | Phase Difference |
| Sine wave |  |  |
| Square wave |  |  |
| Triangle (ramp with 50% symmetry) |  |  |
| Sawtooth (ramp with 25% symmetry) |  |  |

Table 2. Differentiator sinusoidal input and output waveform measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Input Voltage (peak-peak) | Calculated Output Voltage  (peak-peak) | Measured Output Voltage  (peak-peak) | Percent Error |
| 1 kHz | 2 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 2 kHz | 2 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 3 kHz | 2 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |

Step 3:

Table 3. Integrator input and output waveform descriptions

|  |  |  |
| --- | --- | --- |
| Input Waveform Description | Output Waveform Description | Phase Difference |
| Sine wave |  |  |
| Square wave |  |  |
| Ramp (0 % symmetry) |  |  |

Table 4. Integrator sinusoidal input and output waveform measurement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency |  | Input Voltage (peak-peak) | Calculated Output Voltage  (peak-peak) | Measured Output Voltage  (peak-peak) | Percent Error |
| 1 kHz |  | 2 |  |  |  |
|  | 4 |  |  |  |
|  | 5 |  |  |  |
| 2 kHz |  | 2 |  |  |  |
|  | 4 |  |  |  |
|  | 5 |  |  |  |
| 3 kHz |  | 2 |  |  |  |
|  | 4 |  |  |  |
|  | 5 |  |  |  |

Step 4:

4. d. Calculated R2 voltage: Measured R2 voltage:

4 e. Integrator output voltage (peak-peak):

Table 5. PWM duty cycle vs. reference voltage.

|  |  |
| --- | --- |
| Duty Cycle | Reference Voltage, *V*ref |
| 5% |  |
| 25% |  |
| 50% |  |
| 75% |  |
| 95% |  |