



4 Tutorial (Pulse Analysis)

Waveforms

- 1 For repetitive waveforms in Figure 1 determine the DC offset (which is the average value of the waveform).

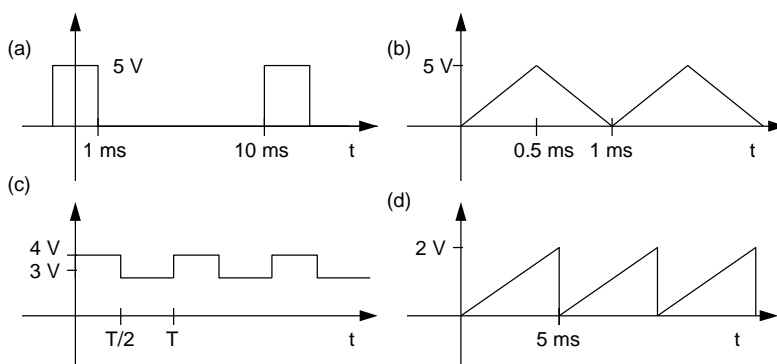


Figure 1 Question 1

- 2 For repetitive waveforms in Figure 2 determine they have a DC offset and if they are made up of sines or cosines.

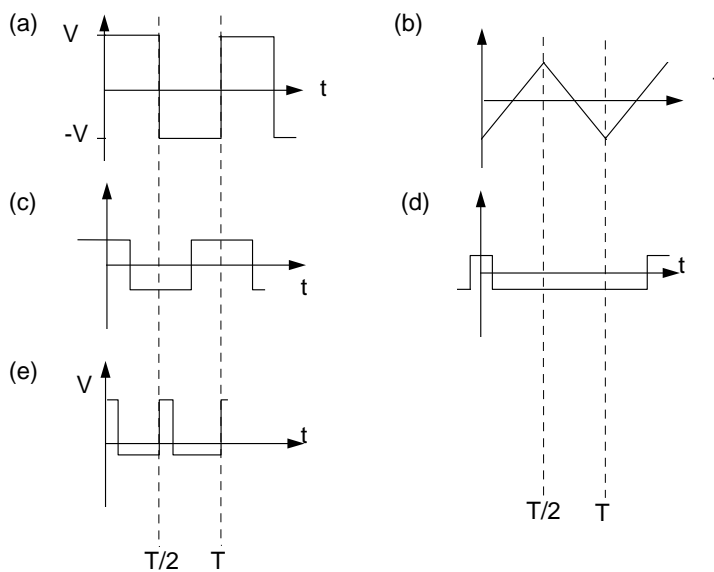


Figure 2 Question 2

Amplitudes

- 3 For a pulse amplitude of 5V, a pulse rate of 2Hz, calculate the amplitude of the first four frequencies in the spectrum (the first one has been completed):

Frequency	Duty Cycle=0.2	Duty Cycle=0.5	Duty Cycle=0.8
0Hz	1.0		
2Hz	1.871		
4Hz	1.514		
6Hz	1.009		
8Hz	0.468		

Check these against: <http://www.asecuritysite.com/comms/pulse>

$$v(t) = \frac{Vt}{T} + \sum_{N=1}^{\infty} \left[\frac{2Vt}{T} \cdot \frac{\sin(N\pi t/T)}{N\pi t/T} \right] \cos(N\omega t)$$

- 4 For the repetitive waveforms in Figure 3 determine the following:
- the DC offset;
 - the first 10 harmonics amplitudes;
 - a sketch of the frequency spectrum;
 - the time response using the DC offset using the first five harmonics.
- 5 Determine the shape of frequency spectrum for the following duty cycles.
- Duty cycle = 0.25
 - Duty cycle = 0.125
 - Duty cycle = 0.03125

Display the first 13 harmonics and discuss the outline. Determine which pulse would be most affected when passed through a low-pass filter.

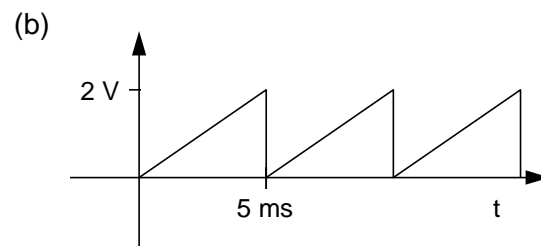
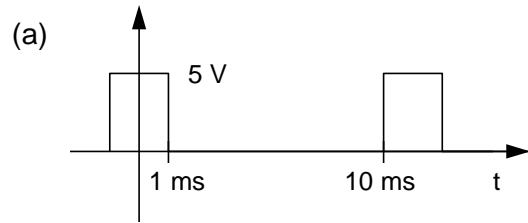


Figure 3 Question 3