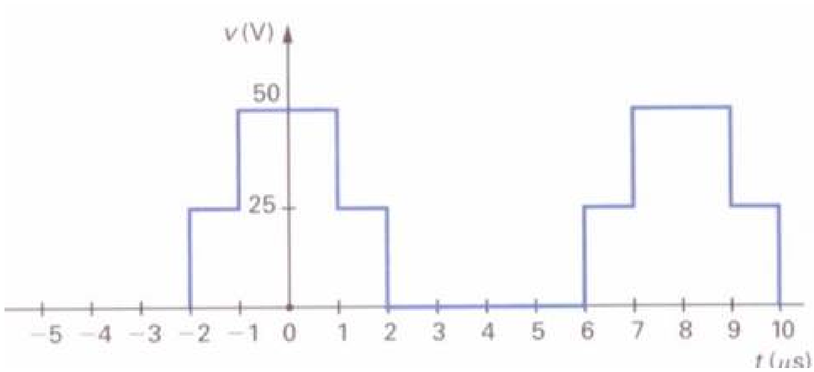
Started on	Wednesday, 1 May 2019, 1:43 PM
State	Finished
Completed on	Wednesday, 1 May 2019, 1:43 PM
Time taken	29 secs
Grade	**100.00** out of 100.00

Question 1

Correct

Mark 11.00 out of 11.00



P16.08b_6ed

Use waveform symmetry and find the Fourier series coefficients for this periodic waveform.

a) Find ω_0 in radians per second.

ω_0 = 785398 rad/sec

b) Find f_0 in Hertz.

f_0 = 125000 Hz

c) Find a_v.

a_v = 18.75 Volts

d) Find a_k.

a_k = 50 /(kπ) [sin(kπ/2) + sin(kπ/4)] Volts

e) Find b_k.

b_k = 0 for all k

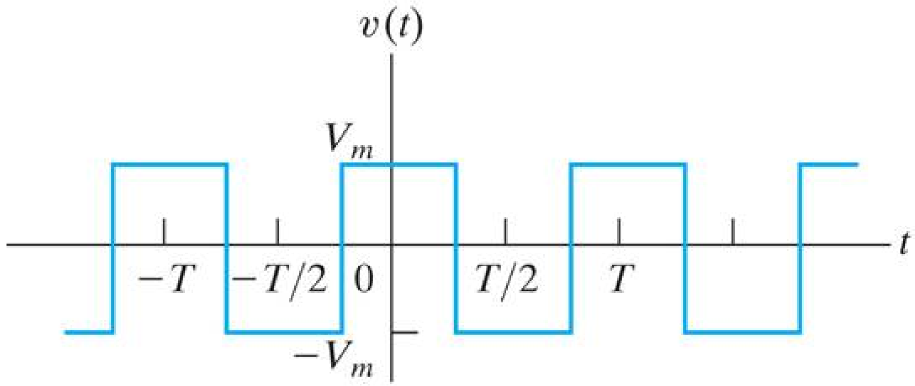
Correct

Marks for this submission: 11.00/11.00.

Question 2

Correct

Mark 11.00 out of 11.00



P16.13a_10ed

Use waveform symmetry and find the Fourier series coefficients for this periodic waveform.

a) Find a_v.

a_v = 0 Volts

b) Find a_k.

a_k = (4 V_m /kπ) sin(kπ/ 2) Volts for k odd

c) Find b_k.

b_k = 0 for all k

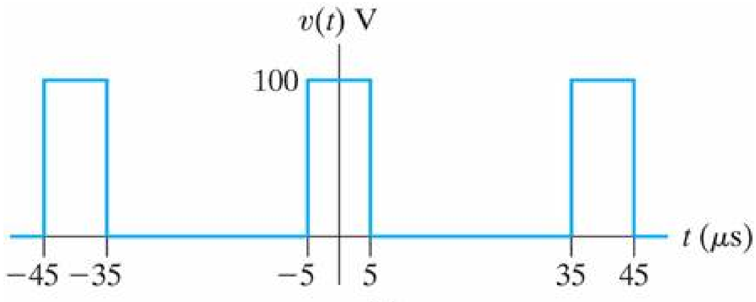
Correct

Marks for this submission: 11.00/11.00.

Question 3

Correct

Mark 11.00 out of 11.00



P16.19b_9ed

Given: $v(t)=25+\frac{200}{\pi}\sum_{n=1}^{\infty}\frac{1}{n}\sin\left(\frac{\pi n}{4}\right)\cos(n\omega_0 t) Volts$

The Fourier Series for this waveform using the Alternative Trigonometric Form given by

$$f(t)=a_v+\sum_{n=1}^{\infty}A_n\cos(n\omega_0 t-\theta_n)$$

Determine:

The average value a_v = 25 Volts

A_1 = 45 Volts and θ_1 = 0 ° (Degrees)

A_2 = 32 Volts and θ_2 = 0 ° (Degrees)

A_3 = 15 Volts and θ_3 = 0 ° (Degrees)

A_4 = 0 Volts and θ_4 = 0 ° (Degrees)

A_5 = -9 Volts and θ_5 = 0 ° (Degrees)

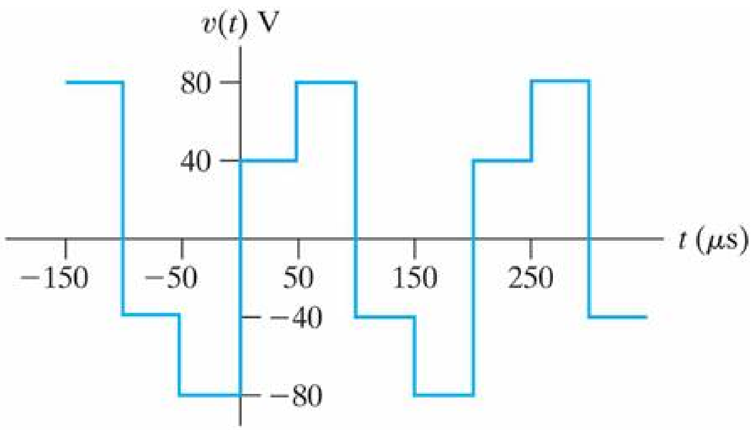
Correct

Marks for this submission: 11.00/11.00.

Question 4

Correct

Mark 11.00 out of 11.00



P16.19a_9ed

Given:

$$v(t) = \frac{-80}{\pi} \sum_{n=1,3,5,\ldots}^{\infty} \frac{1}{n} \sin\left(\frac{\pi n}{2}\right) \cos(n\omega_0 t) + \frac{240}{\pi} \sum_{n=1,3,5,\ldots}^{\infty} \frac{1}{n} \sin(n\omega_0 t)$$

Rewrite the Fourier Series for this waveform using the Alternative Trigonometric Form given by

$$f(t) = a_v + \sum_{n=1}^{\infty} A_n \cos(n\omega_0 t - \theta_n)$$

The alternate form is

For n = 1, 5, 9, … A_n = 252 / nπ

angle θ_n = -108 ° (Degrees, CW from the origin)

For n = 3, 7, 11,…A_n = 252 / nπ

and angle θ_n = -71.6 ° (Degrees, CW from the origin)

CW = Clock-wise

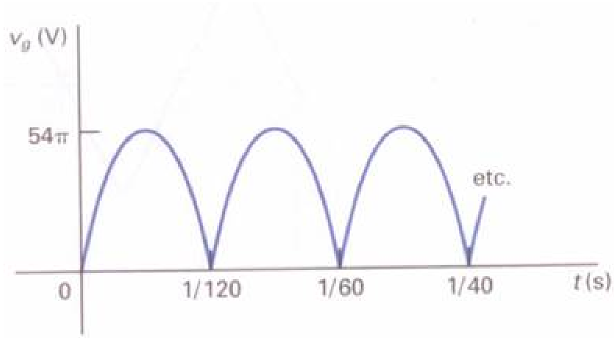
Correct

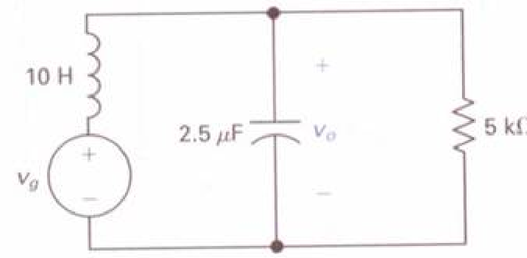
Marks for this submission: 11.00/11.00.

Question 5

Correct

Mark 11.00 out of 11.00





P16.27_6ed

The full-wave rectified sine-wave voltage is applied to the circuit shown.

Find the circuit's response $v_0(t)$ by using the first four nonzero Fourier series terms.

$v_{0\text{'avg}}(t) =$ 108 Volts

$v_{0\text{'}1}(t) =$ 5.41 cos(240 π t + 6.52 °) Volts

$v_{0\text{'}2}(t) =$ .2574 cos(480 π t + 3.09 °) Volts

$v_{0\text{'}3}(t) =$ .0485 cos(720 π t + 2.04 °) Volts

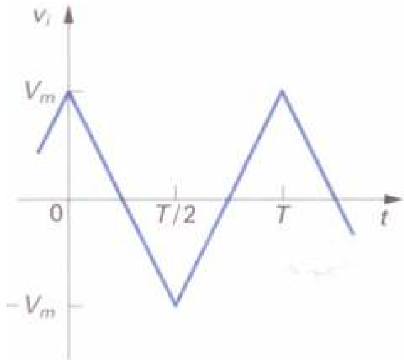
Correct

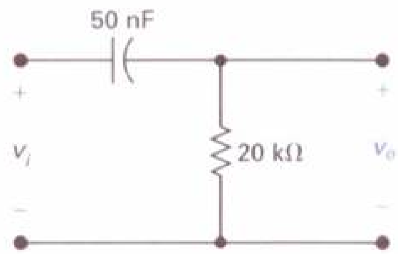
Marks for this submission: 11.00/11.00.

Question 6

Correct

Mark 11.00 out of 11.00





P16.23_6ed

Given: The maximum amplitude of the input signal is $V_m = 450\,\pi^2$ mV (milli V) with a period T = 2π ms (milli sec) (π = pi).

$$v(t)=\left[V_m\right]-\frac{4V_m t}{T}\text{ over the interval }0\le t\le\frac{T}{2}$$

$$v(t)=\frac{4V_m t}{T}-3V_m\text{ over the interval }\frac{T}{2}\le t\le T$$

You should be able to simplify the Fourier series to

$$v(t)=3.6\sum_{n=1,3,5,\ldots}^{\infty}\frac{\cos(n\omega_0 t)}{n^2}$$

The periodic triangular–wave voltage is applied to the filter circuit shown.

Estimate the filter circuit's output (response) $v_0(t)$ from the first three nonzero Fourier series terms.

$v_{0,1}(t)$ = 2.54 cos(1000 t + 45 °) Volts

$v_{0,3}(t)$ = .38 cos(3000 t + 18.4 °) Volts

$v_{0,5}(t)$ = .14 cos(5000 t + 11.3 °) Volts

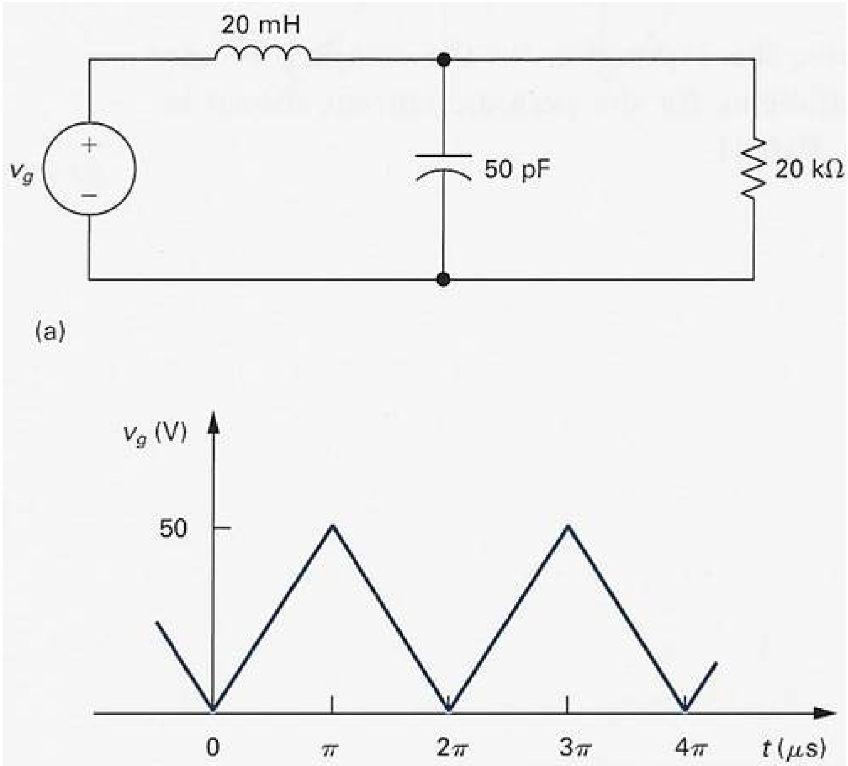
Correct

Marks for this submission: 11.00/11.00.

Question 7

Correct

Mark 11.00 out of 11.00



P16.38_6ed

The triangular-wave voltage source is applied to this circuit.

The equation for the function = $50 \times 10^{6}\, t/\pi$ for $0 \le t \le \pi$ μs (micro sec)

Estimate the average power delivered to the 20 kΩ (kilo (Ohm) resistor when the circuit is in steady-state operation.

$P_{20\Omega,\text{steady-state}}$ = 41.6 mW (milli W)

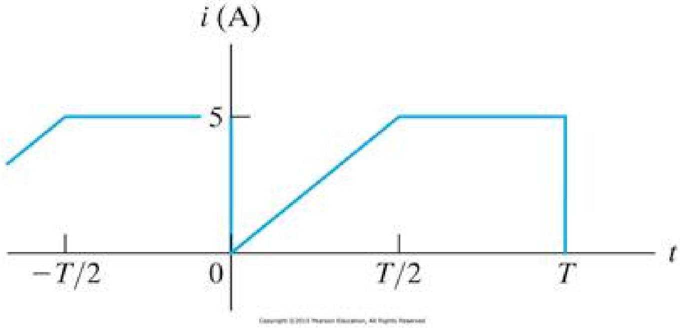
Correct

Marks for this submission: 11.00/11.00.

Question 8

Correct

Mark 11.00 out of 11.00



P16.33_10ed

The periodic current waveform is applied to a 2.5 kΩ (kilo Ohm) resistor.

Given: $i(t) = \frac{I_m}{\frac{T}{2}} t$ for $0 \le t \le T/2$ and $i(t) = I_m$ for $T/2 \le t \le T$ where $I_m = 5$ A

a) Use the first three nonzero terms in the Fourier Series representation of i(t) to estimate the average power dissipated in the 2.5 kW (kilo Ohm) resistor.

$P_{2.5\ k\Omega,estimate}$ = 40.4 kW (kilo Watt)

b) Calculate the exact value of the average power dissipated in the 2.5 kΩ (kilo Ohm) resistor. Hint: You must use the rms integral for the current waveform.

$P_{2.5\ k\Omega,exact}$ = 41.67 kW (kilo Watt)

c) Find the error in % between the exact and approximate power calculations from part a) and part b). ("True" = Exact)

$$\%Error = \frac{\text{True Value} - \text{Estimate}}{\text{TrueValue}} \times 100$$

% Error = 3.05 "-" under estimate "+" = over estimate

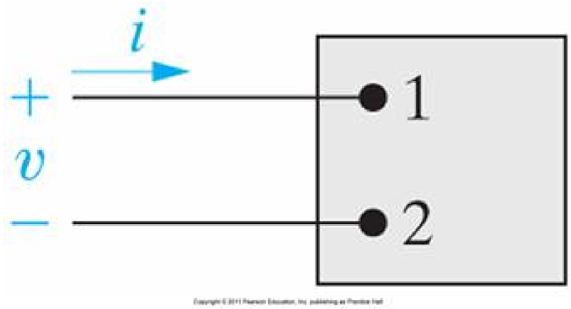
Correct

Marks for this submission: 11.00/11.00.

Question 9

Correct

Mark 12.00 out of 12.00



P16.35_6ed

The voltage and current at the terminals of this network are

$v(t) = 80 + 200 \cos(500t + 45°) + 60 \sin(1{,}500t)$ Volts

$i(t) = 10 + 6 \sin(500t + 75°) + 3 \cos(1{,}500t - 30°)$ Amps

a) What is the average power at element's terminals?

P = 1145 W

b) What is the rms value of the voltage?

V_{rms} = 168 V_{rms}

c) What is the rms value of the current?

I_{rms} = 11 A_{rms}

Correct

Marks for this submission: 12.00/12.00.

◀ Homework 13 - Chapter 15 and 16

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Quiz 1 - Chapter 9 ▶