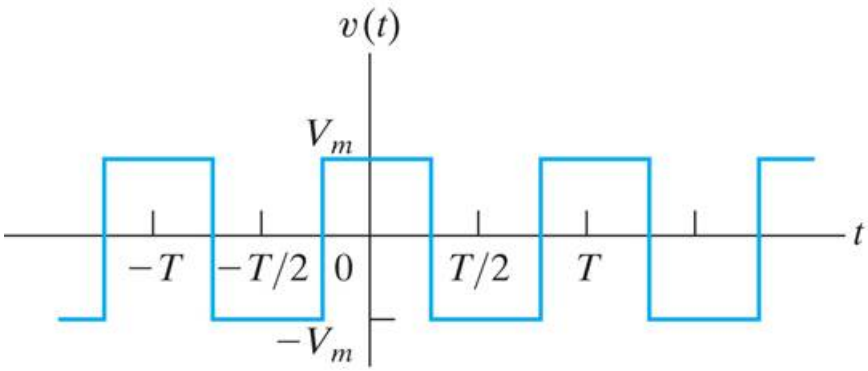
Started on	Sunday, 7 May 2017, 11:58 AM
State	Finished
Completed on	Sunday, 7 May 2017, 9:41 PM
Time taken	9 hours 43 mins
Grade	**100.00** out of 100.00

Question 1

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 /π) sin(kπ/ 2 ✓) Volts for k odd

c) Find b_k.

b_k = 0 ✓

for all k

a) a_v = 0 V

b) a_k = $(4V_m/\pi)$ sin(kπ/2) Volts for k odd

c) b_k = 0 for all k

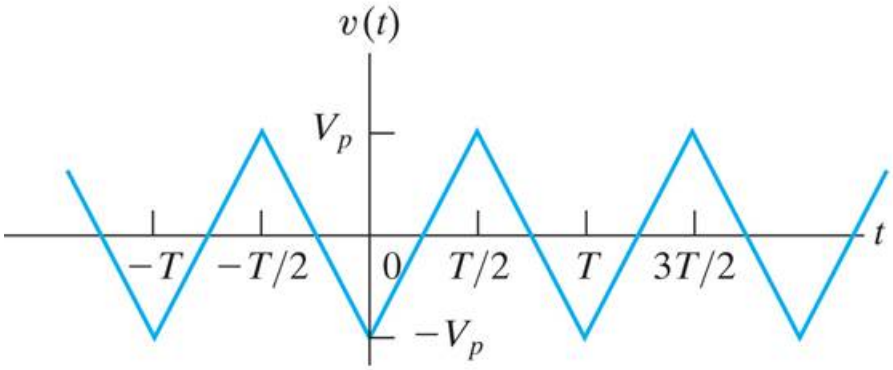
Correct

Marks for this submission: 11.00/11.00.

Question 2

Correct

Mark 11.00 out of 11.00



P16.13b_10ed

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

Given over the time range zero to T/2.

a) Find a_v.

a_v = 0 ✓

Volts

b) Find a_k.

a_k = (-8 ✓

Vm / (kπ)^2) Volts for k odd

c) Find b_k.

b_k = 0 ✓

for all k

a) a_v = 0 V

b) a_k =-8V_p /(kπ)^2 Volts for k odd

c) b_k = 0 for all k

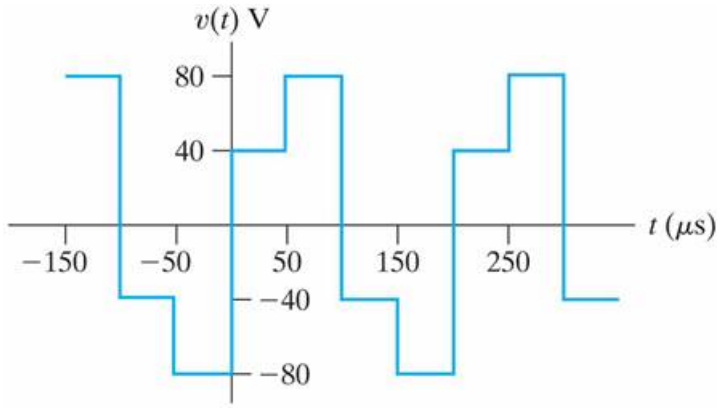
Correct

Marks for this submission: 11.00/11.00.

Question 3

Correct

Mark 11.00 out of 11.00



P16.19a_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 = 252.98 ✓

/ nπ

angle θ_n = -108.44 ✓

° (Degrees, CW from the origin)

For n = 3, 7, 11,…A_n = 252.98 ✓

/ nπ

and angle θ_n = -71.56 ✓

° (Degrees, CW from the origin)

CW = Clock-wise

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

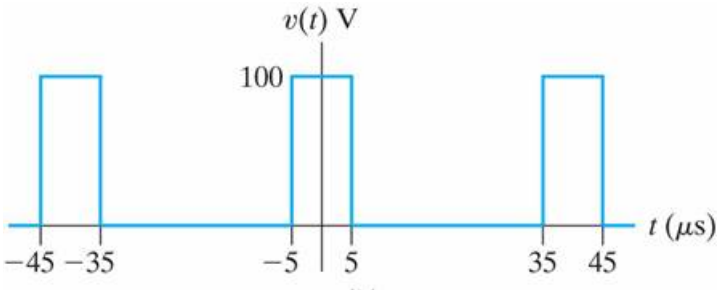
Correct

Marks for this submission: 11.00/11.00.

Question 4

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 = 45.01 ✓

Volts and θ_1 = 0 ✓ ° (Degrees)

A_2 = 31.83 ✓

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 = -9.003 ✓

Volts and θ_5 = 0 ✓ ° (Degrees)

$$v(t)=25+\frac{200}{\pi}\sum_{n=1}^{\infty}\frac{1}{n}\sin\left(\frac{\pi n}{4}\right)\cos(n\omega_0 t-0^\circ)Volts$$

A_1 = 45.0158 Volts and θ_1 = 0°

A_2 = 31.8310 Volts and θ_2 = 0°

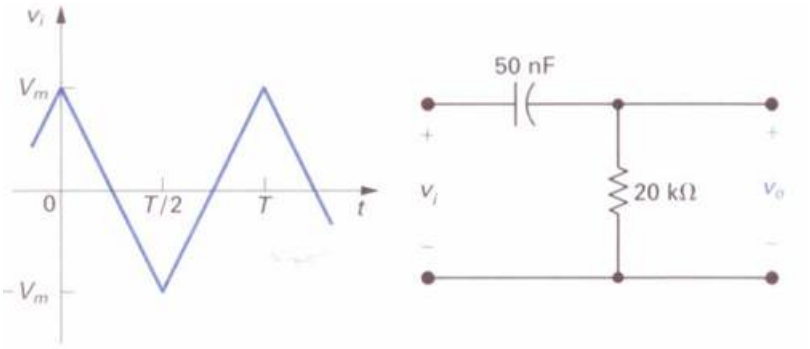
A_3 = 15.0053 Volts and θ_3 = 0°

A_4 = 0 (zero) Volts and θ_4 = 0°

A_5 = -9.0032 Volts and θ_5 = 0°

Correct
Marks for this submission: 11.00/11.00.

Question 5
Correct
Mark 11.00 out of 11.00



P16.23_6ed

Given: v(t) = 450 π^2 mV (milli V) with a period T = 2π ms (milli sec) (π = pi).

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

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

You should be able to simplify the Fourier series to

$v_{0,1}(t)$ = 2.545 ✓

cos(1000 ✓ t + 45 ✓ °) Volts

$v_{0,3}(t)$ = .38 ✓

cos(3000 ✓ t + 18.43 ✓ °) Volts

$v_{0,5}(t)$ = .141 ✓

cos(5000 ✓ t + 11.31 ✓ °) Volts

$v_{0,1}(t)$ = 2.5456cos(1,000t + 45.0°)

$v_{0,3}(t)$ = 0.3795cos(3,000t +18.43°) Volts

$v_{0,5}(t)$ = 0.1412cos(5,000t + 11.31°) Volts

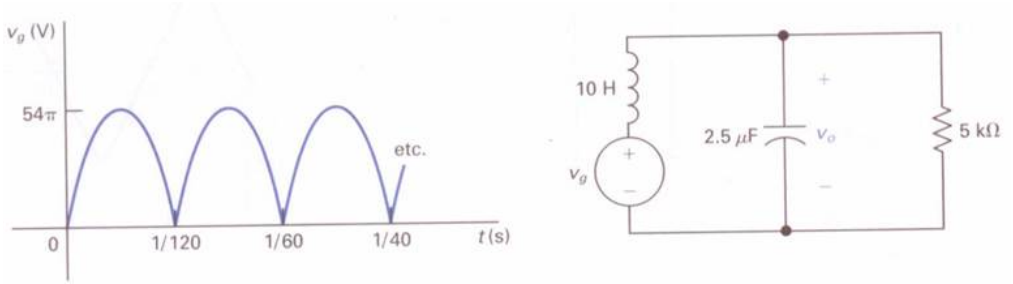
v(t) = 2.5456cos(1,000t + 45.0°) + 0.3795cos(3,000t +18.43°) + 0.1412cos(5,000t + 11.31°) Volts

Correct
Marks for this submission: 11.00/11.00.

Question 6

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.

$v_{0,avg}(t)$ = 108 ✓

Volts

$v_{0,1}(t)$ = 5.41 ✓

cos(240 ✓ π t + 6.51 ✓ °) Volts

$v_{0,2}(t)$ = .257 ✓

cos(480 ✓ π t + 3.08 ✓ °) Volts

$v_{0,3}(t)$ = .049 ✓

cos(720 ✓ π t + 2 ✓ °) Volts

$v_{0,avg}(t)$ = 108 Volts

$v_{0,1}(t)$ = 5.4143 cos(240πt + 6.51°) Volts

$v_{0,2}(t)$ = 0.2575 cos(480πt + 3.09°) Volts

$v_{0,3}(t)$ = 0.0486 cos(720πt + 2.04°) Volts

v(t) = 108+5.4143 cos(240πt + 6.51°) + 0.2575 cos(480πt + 3.09°) + 0.0486 cos(720πt + 2.04°) Volts

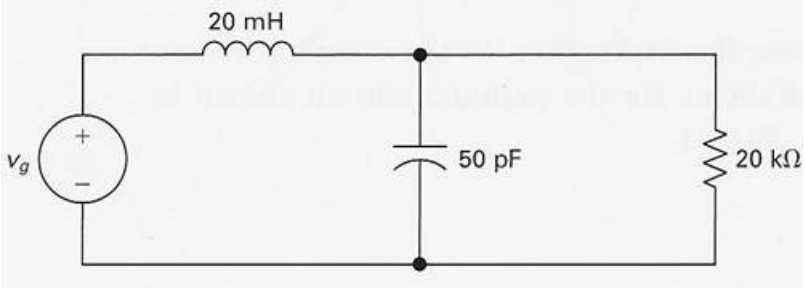
Correct

Marks for this submission: 11.00/11.00.

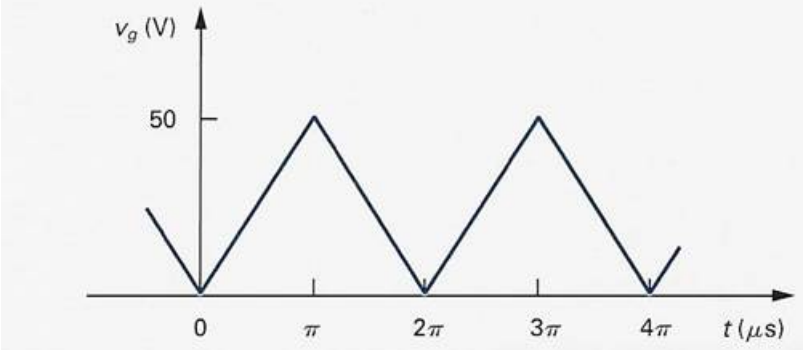
Question 7

Correct

Mark 11.00 out of 11.00



(a)



P16.38_6ed

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

The equation for the function = 50 x 10^6 t /π 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.

$P_{20\Omega,\text{steady-state}}$ = 41.64 ✓

mW (milli W)

P_{20O},steady-state = 41.532 mW

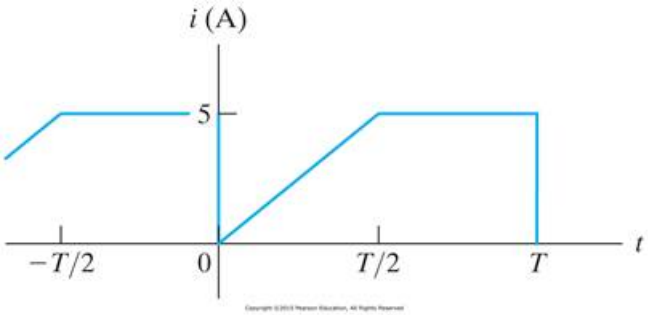
Correct

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 ≤ t ≤ T/2 and i(t) = I_m for T/2 ≤ t ≤ 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)

b) Calculate the exact value of the average power dissipated in the 2.5 kΩ (kilo Ohm) resistor.

% Error = -3.05

"-" under estimate "+" = over estimate

a) $P_{2.5\ kW,estimate}$ = 40.3974 kW

b) $P_{2.5\ kW,exact}$ = 41.6667 kW

c) % error = -3.046%

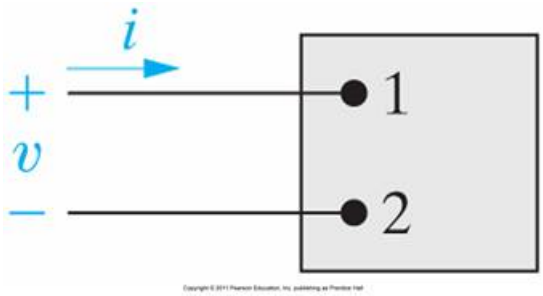
Correct

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} = 167.93 ✓

V_{rms}

c) What is the rms value of the current?

I_{rms} = 11.06 ✓

A_{rms}

a) P = 1,145 W

b) V_{rms} = 167.9286 V_{rms}

c) I_{rms} = 11.0680 I_{rms}

Correct

Marks for this submission: 12.00/12.00.