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NPTEL (https://swayam.gov.in/explorer?ncCode=NPTEL) » Basic Electrical Circuits (course)

Announcements (announcements)

About the Course (preview)

Ask a Question (forum)

Progress (student/home)

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Unit 12 - Week 10 : First order circuits with time-varying inputs

Course outline

How does an NPTEL online course work?

Week 0

Week 1: Preliminaries; Current and voltage; Electrical elements and circuits; Kirchhoff's laws; Basic elements; Linearity

Week 2: Elements in series and parallel; Controlled sources

Week 3: Power and energy in electrical elements; Circuit analysis methods

Week 4: Nodal analysis

Week 5 : Mesh analysis; Circuit theorems

Week 6: More circuit theorems; Two port parameters

Week 7: Two port parameters continued; Reciprocity in resistive networks

Week 8: Opamp and negative feedback; Example circuits and additional topics

Week 9 :First Order Circuits

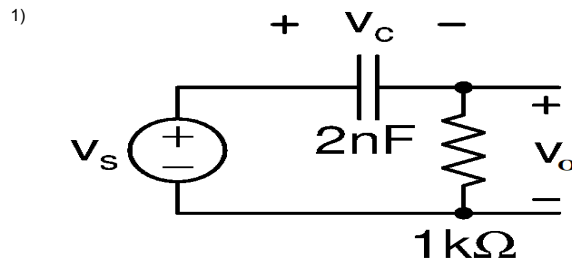
Week 10 : First order circuits with time-varying inputs

- First order RC circuit with an exponential input (unit? unit=21&lesson=155)
- First order RC response to its own natural response (unit? unit=21&lesson=153)
- First order RC response to a sinusoidal input (unit? unit=21&lesson=154)
- First order RC response to a sinusoidal input-via the complex exponential (unit? unit=21&lesson=156)
- Summary: Linear circuit response to sinusoidal input

Assignment 10

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-11-25, 23:59 IST.



In the circuit above, $v_c(0^-) = 1$ V. $v_s(t) = 2 \exp(-t/1 \mu\text{s})$ V. The output for $t > 0$ is of the following form:

$$v_o(t) = \underbrace{V_1 \exp(-t/\tau_1)}_{\text{Forced response}} + \underbrace{V_2 \exp(-t/\tau_2)}_{\text{Natural response}}$$

Determine V_1 , τ_1 , V_2 , τ_2 .

Value of V_1

(The answer must be in volts (V). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 3.9,4.1

1 point

2) Value of τ_1

(The answer must be in microseconds (μs). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

1 point

via the complex exponential (unit?unit=21&lesson=157)

Three methods of calculating the sinusoidal steady state response (unit? unit=21&lesson=158)

Calculating the total response including initial conditions (unit? unit=21&lesson=159)

Why are sinusoids used in measurement? (unit? unit=21&lesson=160)

Basic Electrical Circuits : Week 10 Feedback Form (unit?unit=21&lesson=203)

Quiz : Assignment 10 (assessment?name=226)

Week 10 Lecture materials (unit?unit=21&lesson=228)

Assignment 10 solutions (unit?unit=21&lesson=234)

Week 11: Second order system response

Week 12: Direct calculation of steady state response from equivalent components

Text Transcripts

Download Videos

3) Value of V_2

(The answer must be in volts (V). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) -3.1,-2.9

1 point

4) Value of τ_2

(The answer must be in microseconds (μ s). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.

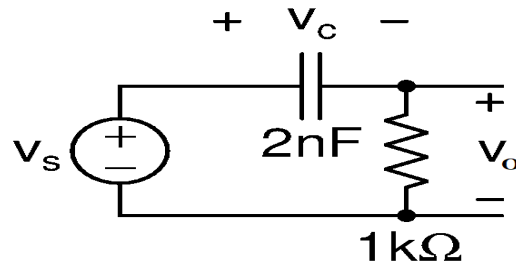
Score: 0

Accepted Answers:

(Type: Numeric) 2

1 point

5)



In the circuit above, $v_c(0^-) = -1\text{ V}$. $v_s(t) = 3\exp(-t/2\mu\text{s})\text{ V}$. The output for $t > 0$ is of the following form:

$$v_o(t) = (V_1 + V_2 t/\tau)\exp(-t/\tau)$$

Determine V_1 and V_2 .

Value of V_1

(The answer must be in volts (V). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 3.9,4.1

1 point

6) Value of V_2

(The answer must be in volts (V). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.

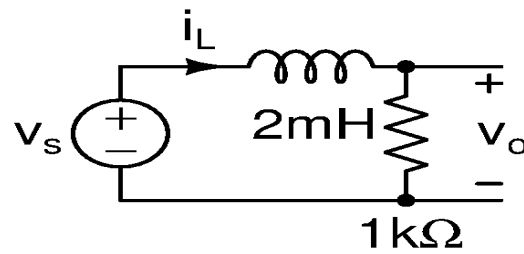
Score: 0

Accepted Answers:

(Type: Range) -3.1,-2.9

1 point

7)



In the circuit above, $i_L(0^-) = 1 \text{ mA}$. $v_s(t) = 2 \cos(5 \cdot 10^5 t) \text{ V}$. The output for $t > 0$ is of the following form:

$$v_o(t) = V_1 \cos(\omega_0 t + \phi_0) + V_2 \exp(-t/\tau)$$

Determine V_1 , V_2 , ϕ_0 , ω_0 .

Value of V_1

(The answer must be in volts (V). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.3,1.5

1 point

8) Value of V_2

(The answer must be in volts (V). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

1 point

9) Value of ϕ_0

(The answer must be in degrees ($^\circ$). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -46,-44

1 point

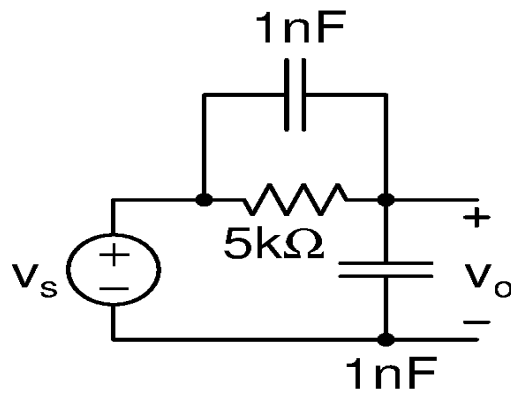
10) Value of ω_0

(The answer must be in kiloradians per second (krad/s). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 500

1 point

11)



In the circuit above, $v_s(t) = \sin(10^5 t)$ V. The forced response is $V_p \cos(10^5 t + \phi)$. Determine V_p and ϕ .

Value of V_p

(The answer must be in millivolts (mV). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 789,792

1 point

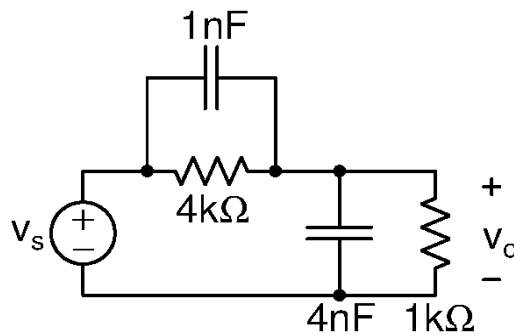
12) Value of ϕ

(The answer must be in degrees ($^\circ$). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -110,-107

1 point

13)



In the circuit above, $v_s(t) = \cos(10^6 t)$ V. The forced response is $V_p \cos(10^6 t + \phi)$. Determine V_p and ϕ .

Value of V_p

(The answer must be in millivolts (mV). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 199,201

1 point

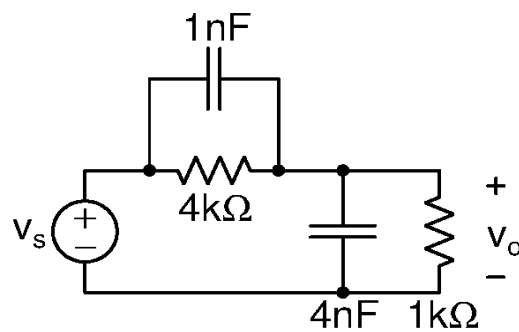
14) Value of ϕ

(The answer must be in degrees ($^{\circ}$). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

1 point

15)



In the circuit above, $v_s(t) = \cos(10^5 t)$ V. The forced response is $V_p \cos(10^5 t + \phi)$.
Determine V_p and ϕ .

Value of V_p

(The answer must be in millivolts (mV). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 199,201

1 point

16) Value of ϕ

(The answer must be in degrees ($^{\circ}$). Round off fractional answers to 1 decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

1 point

