

X


<https://swayam.gov.in>

https://swayam.gov.in/nc_details/NPTEL

reviewer6@nptel.iitm.ac.in

[NPTEL \(https://swayam.gov.in/explorer?ncCode=NPTEL\)](https://swayam.gov.in/explorer?ncCode=NPTEL) » [Basic Electrical Circuits \(course\)](#)
[Announcements \(announcements\)](#)
[About the Course \(preview\)](#)
[Ask a Question \(forum\)](#)
[Progress \(student/home\)](#)
[Mentor \(student/mentor\)](#)

Unit 11 - Week 9 :First Order Circuits

Course outline

How does an NPTEL online course work?

Week 0

Week 1: Preliminaries; Current and voltage; Electrical elements and circuits; Kirchoff'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

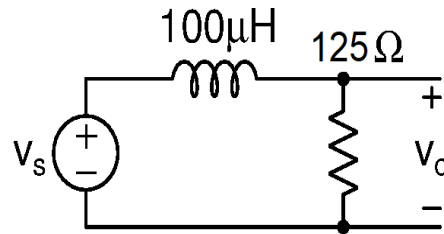
- Circuits with storage elements(capacitors and inductors) (unit? unit=20&lesson=139)
- First order circuit with zero input-natural response (unit? unit=20&lesson=136)
- First order RC circuit with zero input-Example (unit? unit=20&lesson=140)
- First order circuit with a constant input (unit? unit=20&lesson=137)
- General form of the first order circuit response (unit? unit=20&lesson=138)
- First order RC circuit with a constant input-Example

Assignment 9

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

Due on 2020-11-18, 23:59 IST.

1)



The circuit above obeys the following differential equation. Determine the parameter τ .

$$\tau \frac{dv_o}{dt} + v_o = v_s(t)$$

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.7,0.9

1 point

(unit?unit=20&lesson=152)

- [○ First order circuit with piecewise constant input \(unit?unit=20&lesson=141\)](#)
- [○ First order circuit with piecewise constant input-Example \(unit?unit=20&lesson=150\)](#)
- [○ First order circuit-Response of arbitrary circuit variables \(unit?unit=20&lesson=142\)](#)
- [○ Summary: Computing first order circuit response \(unit?unit=20&lesson=143\)](#)
- [○ Does a capacitor block DC? \(unit?unit=20&lesson=144\)](#)
- [○ Finding the order of a circuit \(unit?unit=20&lesson=145\)](#)
- [○ First order RC circuits with discontinuous capacitor voltages \(unit?unit=20&lesson=146\)](#)
- [○ Summary: Computing first order circuit response with discontinuities \(unit?unit=20&lesson=147\)](#)
- [○ First order RL circuits \(unit?unit=20&lesson=148\)](#)
- [○ First order RL circuit with discontinuous inductor current-Example \(unit?unit=20&lesson=151\)](#)
- [○ Basic Electrical Circuits : Week 9 Feedback Form \(unit?unit=20&lesson=202\)](#)
- [○ Quiz : Assignment 9 \(assessment?name=224\)](#)
- [○ Week 9 Lecture materials \(unit?unit=20&lesson=227\)](#)
- [○ Assignment 9 solutions \(unit?unit=20&lesson=231\)](#)

Week 10 : First order circuits with time-varying inputs

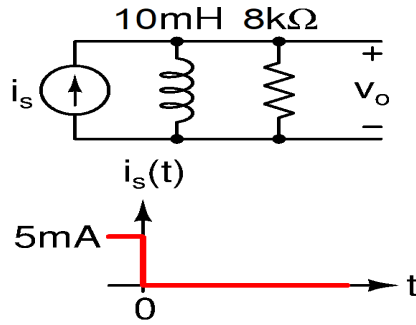
Week 11: Second order system response

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

Text Transcripts

Download Videos

2)



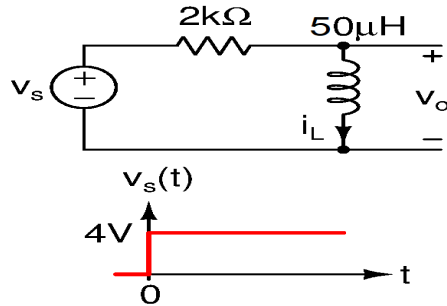
In the circuit above, the current source i_s jumps from 5 mA to zero at $t = 0$ as shown. At $t = 0^-$, the inductor current is 5 mA . Determine the power dissipated in the resistor at $t = 2\ \mu\text{s}$.

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 8.1,8.3

1 point

3)

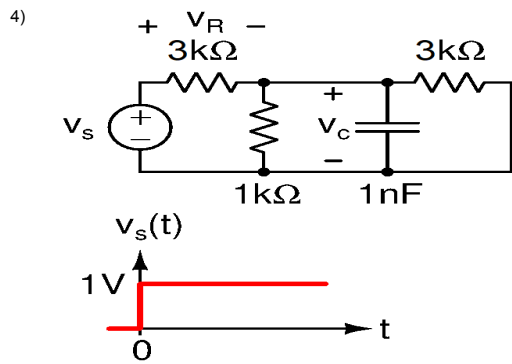


In the circuit above, $i_L(0^-) = -2\text{ mA}$. v_s jumps from zero to 4 V as shown. Determine the time $t_0 > 0$ at which the power dissipated in the resistor is minimum (Hint: To do this, determine $i_L(t)$ for $t > 0$, sketch it, and determine the answer instead of blindly deriving the expression, differentiating, etc.).

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 17.1,17.5

1 point

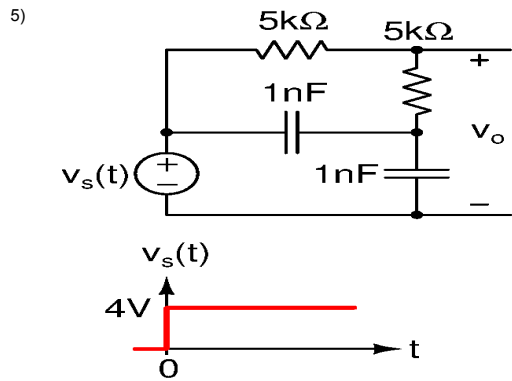


In the circuit above, $v_c(0^-) = 1\text{ V}$. v_s jumps from zero to 1 V at $t = 0$ as shown. Determine $v_R(1\ \mu\text{s})$.

(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) 647,651

1 point



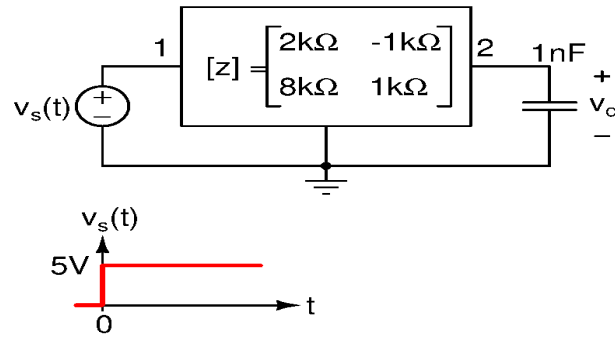
In the circuit above, both capacitors have zero charge on them at $t = 0^-$. v_s jumps from zero to 4 V at $t = 0$. Determine $v_o(10\ \mu\text{s})$.

(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) 3.3,3.5

1 point

6)



In the circuit above, the capacitor is initially discharged. Determine the time constant and the final value of v_c . (This circuit may look different from the others you have seen in this unit, but it is solved using exactly the same general principles: (a) Finding values at 0^+ , ∞ and the time constant, or (b) Writing down the differential equation in terms of v_c .)

Time constant τ

(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: Range) 4.8,5.2

1 point

7)

In question 6 above,

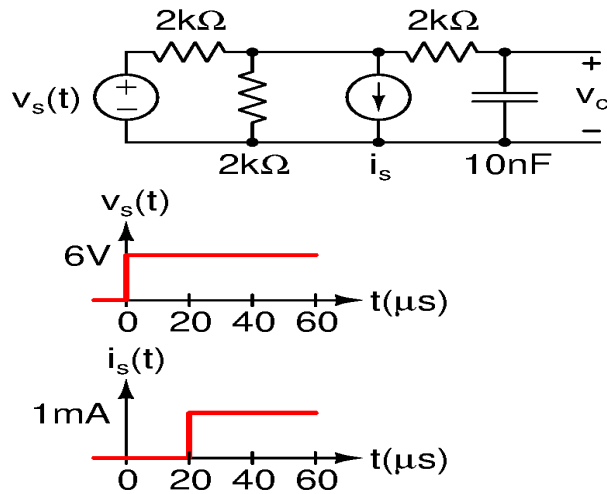
Final value of v_c

(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) 19.8,20.2

1 point

8)



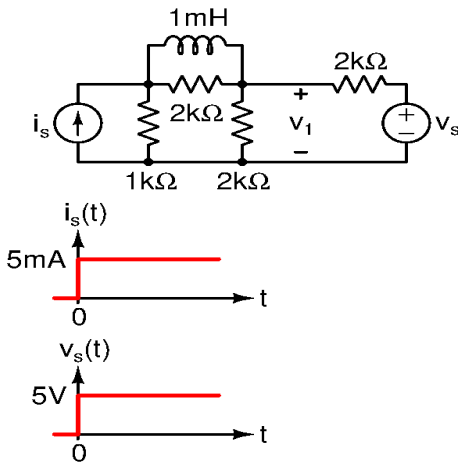
In the circuit above, the capacitor is initially discharged. v_s and i_s are as shown. Determine $v_c(40 \mu\text{s})$.

(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) 1.6,1.8

1 point

9)



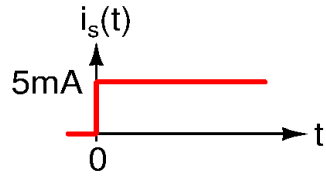
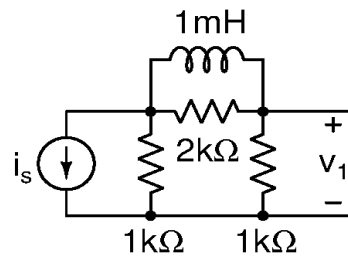
In the circuit above, the inductor has zero initial conditions. Determine $v_1(2 \mu\text{s})$.

(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) 3.6,3.8

1 point

10)



In the circuit above, the inductor has zero initial conditions. Determine $v_1(2\mu\text{s})$.

(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) -2.4,-2.2

1 point