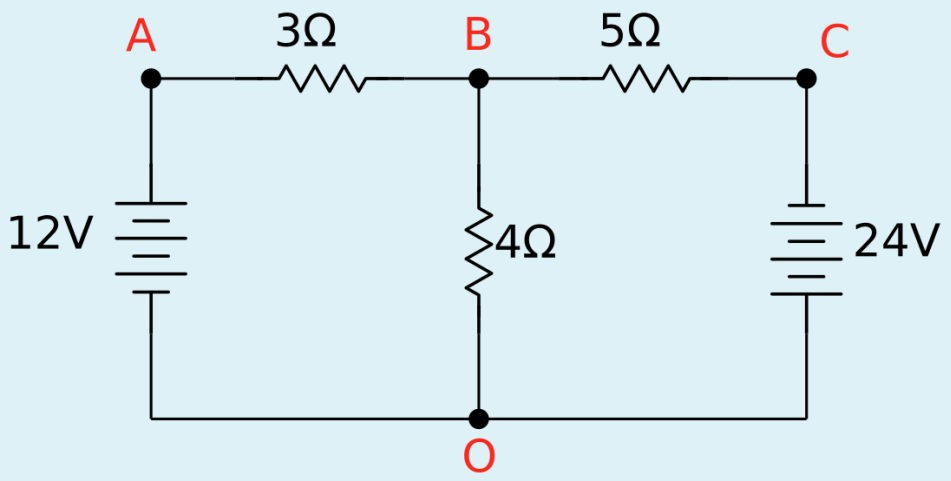
Question 1

Incorrect

Mark 0.00 out of 10.00

Flag question

Find the voltage at Node B in Volts (to at least 3 decimal places)



Question 1

Correct

Mark 10.00 out of 10.00

Flag question

A two terminal device is in an operational circuit given to you. You observe that this device sometimes absorbs power and sometimes delivers power, and the voltage across this device is sometimes "positive" and sometimes "negative".

Based only on this information, the device could be:

Select one or more:

- a. An inductor ✔
- b. An ideal current source
- c. An ideal DC source ✖

Your answer is correct.

The correct answer is: An inductor

Question 2

Correct

Mark 10.00 out of 10.00

Flag question

True or False:
Network theory is applicable only to analysis of electrical networks.

Select one:

- True
- False ✔

The correct answer is 'False'.

Question 1

Correct

Mark 1.00 out of 1.00

Flag question

Kirchoff's Current Law is a direct result of:

Select one:

- a. Ideal Resistors
- b. Current in conductors is carrier by electrons
- c. Ideal Voltage and Current Sources
- d. Conservation of charge: i.e. total charge in a circuit cannot be created or destroyed ✔

Your answer is correct.

The correct answer is: Conservation of charge: i.e. total charge in a circuit cannot be created or destroyed

Question 2

Correct

Mark 1.00 out of 1.00

Flag question

An battery is found to have a voltage "E" across its terminals when no load is connected to it. When a load resistance of "R" Ohms is connected across this battery, the terminal voltage is "V". The internal resistance of the cell is:

Select one:

- $R\left(\frac{E}{V}-1\right)$ ✔
- $2\frac{(E-V)R}{E}$
- $(E-V)/R$
- $2\frac{(E-V)V}{E}$

Your answer is correct.

The correct answer is: $R\left(\frac{E}{V}-1\right)$

Question **1**

Not answered

Marked out of 1.00

Flag question

Three resistors R1, R2 and R3 are in parallel. The equivalent resistance is:
Check all correct answers. +1 point for each correct selection and -1 for each incorrect selection.

Select one:

a. $\frac{R_1R_2+R_2R_3+R_3R_1}{R_1+R_2+R_3}$

b. $\frac{R_1R_2R_3}{R_1R_2+R_2R_3+R_3R_1}$

c. $\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$

d. $\frac{R_1R_2R_3}{R_1+R_2+R_3}$

Your answer is incorrect.

The correct answer is: $\frac{R_1R_2R_3}{R_1R_2+R_2R_3+R_3R_1}$

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

Three resistors R1, R2 and R3 are in parallel. The equivalent resistance is:
Check all correct answers. +1 point for each correct selection and -1 for each incorrect selection.

Select one:

a. $\frac{R_1R_2R_3}{R_1+R_2+R_3}$

b. $\frac{R_1R_2R_3}{R_1R_2+R_2R_3+R_3R_1}$

c. $\frac{R_1R_2+R_2R_3+R_3R_1}{R_1+R_2+R_3}$

d. $\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$

Your answer is correct.

The correct answer is: $\frac{R_1R_2R_3}{R_1R_2+R_2R_3+R_3R_1}$

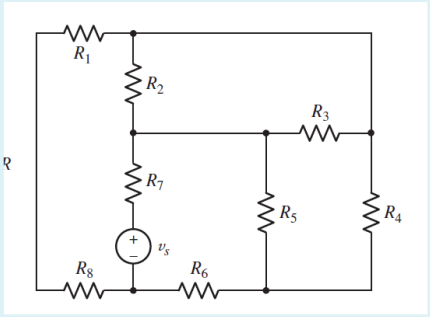
Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

The circuit shown is driven by a single source with a magnitude v_s. Given that the voltage across R_2 is 5V (taking the top end as positive), what is the voltage across R3 (taking the left end as positive)? Enter your answer as a number in volts.



Answer: -5

The correct answer is: -5

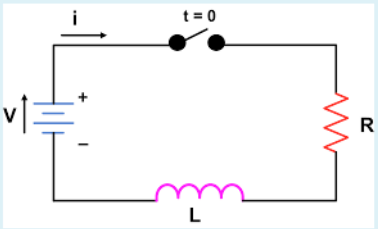
Question **1**

Correct

Mark 10.00 out of 10.00

Flag question

Given a series L-R Circuit as below, where the switch is closed at exactly t=0:



We have seen in class that the differential equation for this system is of the form:

$$\frac{di}{dt} + a_1 i = a_2 v(t)$$

for $t > 0$ and the boundary condition is $i(0) = 0$

What are the coefficient a_1 and a_2 **respectively**?

Select one:

- a. L/R and 1/L
- b. LR and 1/LR
- c. R/L and 1/L ✔
- d. 1 and LR
- e. 1/L and R/L
- f. L/R and L
- g. 1/R and L/R

Your answer is correct.

The correct answer is: R/L and 1/L

Question **1**

Complete

Mark 35.00 out of 40.00

Flag question

For a given system, the input $u(t)$ influences the output

$$y(t)$$

as per the following differential equation

$$\frac{dy}{dt} + 4y = u(t)$$

Solve the differential equation to find the time expression for

$$y(t)$$

, given that the input

$$u(t) = 3t^2 + 7$$

and boundary condition is given as

$$y(0) = 0$$

(You may use the general solution template from the end of Lecture 18)

Write your answer in the form "y(t) = ..."

You may type out your answer in plain text, for example

```
y(t)=sin(3t)+e^(-4t) etc
```

OR you can use LaTeX/Mathjax syntax bound by backslash-parenthesis, i.e.

```
 \( ... \)
```

```
e.g. \(y(t) = \sin (3t)+e^(-4t) \)
```

y(t) = -(3t^2)/16+(3t/8)-(13/16)

Final Solution:

$$y(t) = -\frac{59}{32}e^{-4t} + \frac{3t^2}{4} - \frac{3t}{8} + \frac{59}{32}$$

Question **1**

Correct

Mark 20.00 out of 20.00

Flag question

A student is analyzing the mathematical model for a series circuit that contains one R, one L and one voltage source v(t). The student writes the resulting ODE as

$\frac{1}{2}\frac{dy}{dt} - \frac{\pi}{23}y = \sqrt{33} \times v(t)$

Select all the true statements below. (+1 point for each correct selection and -1 point for each incorrect selection)

Select one or more:

- [x] a. The natural response for this ODE must have a form $k_1 e^{k_2 t}$; k1 and k2 are constants. ✔
- [ ] b. The solution of this differential equation y(t) tends approaches infinity only if $v(t) \neq 0$ for all time t.
- [x] c. The ODE shown cannot possibly represent a real circuit. ✔
- [x] d. The solution of this differential equation y(t) tends approaches infinity as time approaches infinity for any finite-valued v(t). ✔
- [ ] e. The equation is certainly the expression for inductor current.
- [ ] f. Only Initial conditions are missing for this problem - everything else is ok.

Your answer is correct.

The correct answers are: The ODE shown cannot possibly represent a real circuit., The solution of this differential equation y(t) tends approaches infinity as time approaches infinity for any finite-valued v(t)., The natural response for this ODE must have a form $k_1 e^{k_2 t}$; k1 and k2 are constants.

Question **1**

Correct

Mark 5.00 out of 5.00

Flag question

Match each term in the dropdown to the most appropriate option to create all three true statements.

If a function is differentiable it must also be — continuous ✔

For all time t, the function $f(t) = \frac{1}{2}e^{-5t}$ is: — differentiable ✔

A unit step function is: — finite-valued ✔

Your answer is correct.

The correct answer is: If a function is differentiable it must also be → continuous, For all time t, the function $f(t) = \frac{1}{2}e^{-5t}$ is: → differentiable, A unit step function is: → finite-valued

Question **2**

Correct

Mark 5.00 out of 5.00

Flag question

Select all true statements from the following:

Select one or more:

- [ ] a. A unit-step function is continuous.
- [x] b. A unit step function is finite-valued ✔
- [x] c. The integral of a unit impulse over all time (-inf to +inf) is one. ✔
- [ ] d. A continuous function will always be differentiable.

Your answer is correct.

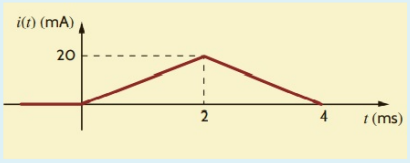
The correct answers are: A unit step function is finite-valued, The integral of a unit impulse over all time (-inf to +inf) is one.

Question **3**

Incorrect

Mark 0.00 out of 10.00

Flag question



A 10mH inductor has terminals marked A and B. The current flowing through the inductor (from A to B) is plotted in the graph above. The voltage across the inductor v_{AB} is:

Select one:

- a. 0.1mV for t<0; -0.1mV for 0<t<2; 0mV for 2<t<4
- b. 0mV for t<0; 0.1mV for 0<t<2; -0.1mV for 2<t<4
- c. -0.1mV for t<0; 0.1mV for 0<t<2; 0mV for 2<t<4
- d. 0mV for t<0; 100mV for 0<t<2; -100mV for 2<t<4
- e. 0mV for t<0; -0.1mV for 0<t<2; 0.1mV for 2<t<4 ✖
- f. 0mV for t<0; -100mV for 0<t<2; 100mV for 2<t<4

Your answer is incorrect.

The correct answer is: 0mV for t<0; 100mV for 0<t<2; -100mV for 2<t<4

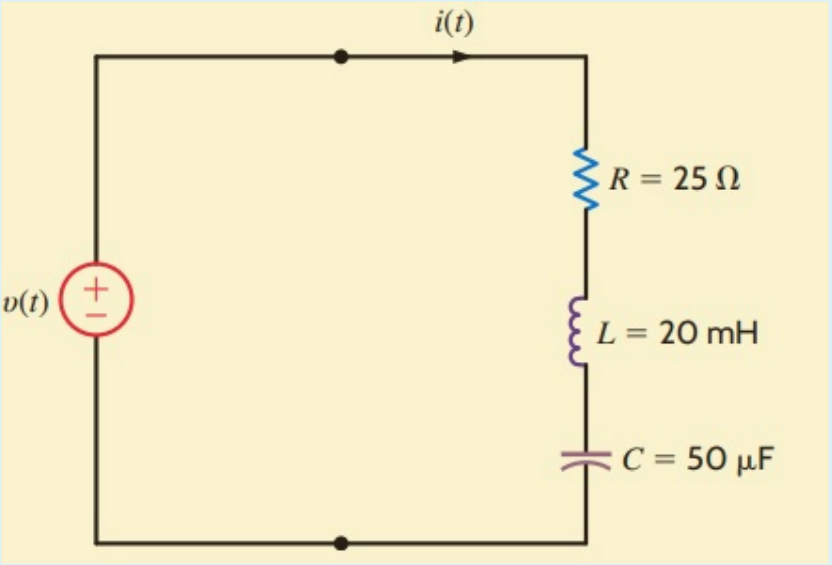
Question **1**

Correct

Mark 10.00 out of 10.00

Flag question

[Enter answers up to 2 decimal, take pi=3.14]



The system frequency for the system shown
is f = 60 Hz and And v(t) = 50 cos (ωt + 30°) Volts.

The total impedance seen by the voltage source is (R + jX)Ω where:

R = 25 ✔

X = -45.51 ✔

Question **2**

Correct

Mark 5.00 out of 5.00

Flag question

The impedance of a pure capacitor is:

Select one:

- a. 1/(2*pi*f*j*C) ✔
- b. (2*pi*f*j*C)
- c. (2*pi*j*C) / f
- d. (2*pi*f) / (j*C)

Your answer is correct.

The correct answer is: 1/(2*pi*f*j*C)

Question **3**

Correct

Mark 5.00 out of 5.00

Flag question

Phasors can be used for a system where all quantities are sinusoidal and have the same:

Select one:

- a. Initial conditions
- b. Amplitude
- c. Zero crossing point
- d. Frequency ✔
- e. Phase Angle

Your answer is correct.

The correct answer is: Frequency

Question **1**

Correct

Mark 25.00 out of 25.00

Flag question

Attempt this problem on your own, following all the steps one by one. After you have solved the problem completely check the option below to indicate that you have successfully completed the task - this quiz is completely self-evaluated. If you have any difficulty feel free to discuss with your peers to give or receive hints (but don't just copy) - or post to Slack.

An industrial motor load is designed to be operated on 230V, 50Hz supply. The machine nameplate says that it has a rated power of 5kW and power factor of 0.5. Assume the voltage to have phase=0 degrees.

1. Draw the circuit diagram for this system?
2. What is the Power Factor Angle?
3. Does the load draw a leading or lagging current?
4. Calculate real power, reactive power and complex power.
5. Calculate the current drawn by this load, both in time domain as well as in phasor representation.
6. What additional load impedance (compensating impedance) should be connected in parallel such that the total system draws unity power factor from the grid? Express this as a complex number (impedance) as well as finding out the equivalent circuit values, i.e. R, L, C for the compensating impedance

Select one:

- a. I have completed all the tasks above ✔
- b. I have not completed all the tasks yet.

Your answer is correct.

The correct answer is: I have completed all the tasks above

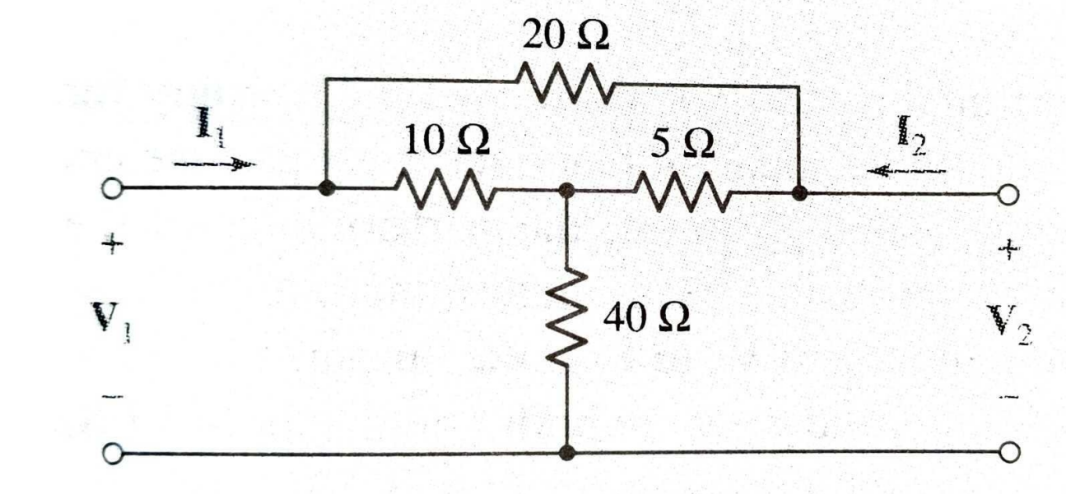
Question **1**

Correct

Mark 4.00 out of 4.00

Flag question

Find the Y parameters (admittance parameters) for the circuit shown below



Y_{11} = 0.1191 ✔ S

Y_{12} = -0.1114 ✔ S

Y_{21} = -0.1114 ✔ S

Y_{22} = 0.1268 ✔ S