Somith Das
2019W1_ELEC_201_101102
Assignment ASN1 due 09/22/2019 at 11:59pm PDT

---

1. (1 point)

The unit for **electric** current is the [?/Ampere /ampere]

Correct Answers:

- ampere

---

2. (1 point)

The reference for voltages in a circuit is always connected to ground. [?/True/False]

Correct Answers:

- False

---

3. (2 points)

The reference for voltages in a circuit is always connected to the negative of a battery. [?/True/False]

Correct Answers:

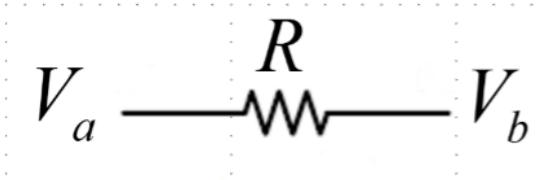
- False

---

4. (12 points)

(a) In the resistor R (27Ω), illustrated below this question, the electric height (using the metaphor introduced in class) of each terminal with respect to the same reference, V_a $(100V)$ and V_b $(750V)$, are given. What is the voltage drop from the left to the right terminal?

Figure:



Voltage drop: ___V

(b) What is the current in amps, and include the direction.

$i =$ ___
- ?
- from a to b
- from b to a
- no direction

(c) What is total energy dissipated (absorbed), in joules, by the resistor during the first three seconds of operation?

Energy dissipated =___J

Correct Answers:

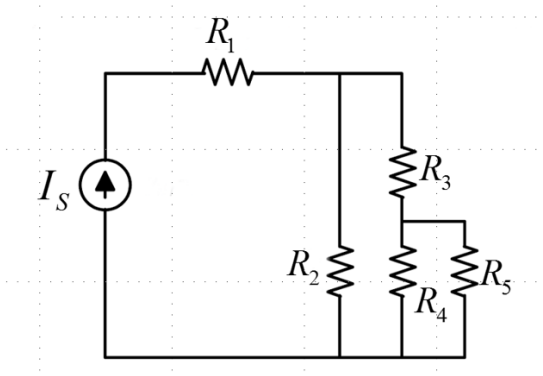
- -650
- -24.0741
- from a to b
- 46944.4

---

5. (12 points)

In the figure below, what is the power (in watts) in the current source when R_1=790Ω, R_2=230Ω, R_3= 330Ω, R_4= 240Ω, R_5=560Ω and I=3A? Include in your answer whether the power is delivered or absorbed by the source.

Figure:



P = ___ Watts [?/absorbed/delivered]

Correct Answers:

- 8526.02
- delivered

---

6. (12 points)

The current in a resistor R (4900Ω), is changing with time according to the sinusoidal function shown below, until it reaches 6 amps at a certain instant t_a. From that point on, the current decays along a linear ramp and reaches zero amps at $2 \cdot t_a$. What is the total energy absorbed by the resistor between $t = 0$ and $t = 2 \cdot t_a$ (answer in joules).

$$i(t) = 6\sin(300t)A \text{ from 0 up to } t_a$$

Total energy absorbed =___J

Correct Answers:

- 769.69

---

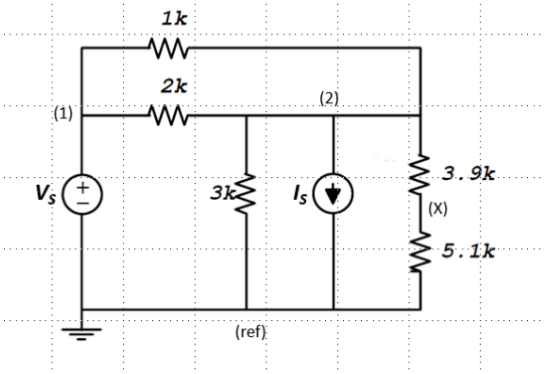
7. (12 points)

In the circuit below, using only Ohm's Law, KVL and KCL and what you know of simplifying resistors in series and resistors in parallel, compute the current in every resistor (include the direction of the current, of course, for that reason all nodes and B-nodes have been labelled. Example: the current flows from (2) to (X)). And compute also, the power in every resistor

$V_S = 34V$

$I_S = 20mA$

Figure:



$I_{1k} =$___A
- ?
- from (1) to (2)
- from (2) to (1)
- no direction

$P_{1k} =$___W

$I_{2k} =$___A
- ?
- from (1) to (2)
- from (2) to (1)
- no direction

$P_{2k} =$___W

$I_{3k} =$___A
- ?
- from (2) to (ref)
- from (ref) to (2)
- no direction

$P_{3k} =$___W

$I_{3.9k} =$___A
- ?
- from (2) to (X)
- from (X) to (2)
- no direction

$P_{3.9k} =$___W

$I_{5.1k} =$___A
- ?
- from (X) to (ref)
- from (ref) to (X)
- no direction

$P_{5.1k} =$___W

Correct Answers:

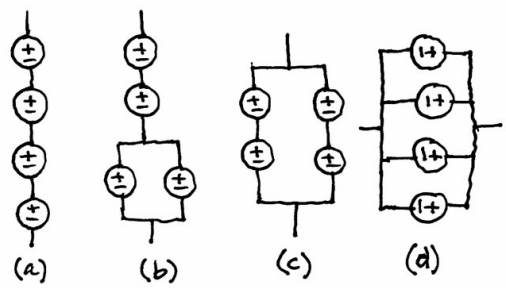
- 0.0180571
- from (1) to (2)
- 0.32606
- 0.00902857
- from (1) to (2)
- 0.16303
- 0.00531429
- from (2) to (ref)
- 0.0847249
- 0.00177143
- from (2) to (X)
- 0.012238
- 0.00177143
- from (X) to (ref)
- 0.0160036

---

8. (12 points)

According to the link below, an alkaline AAA battery stores 5071 joules and keeps an average voltage of 1.225 volts between its terminals. If you are powering a small hobby $3V$ DC motor (it will work with voltages between 2 and 3.5 volts) with four such batteries conveniently connected. **(a)** How would you connect the four batteries? **(b)** If the motor drains 0.05 mA while idling (that is, rotating by itself, without mechanical load), how long, in hours, will the motor run idling before it drains the batteries?

(a) How would you connect the four batteries?
[?/a/b/c/d]



(b) $t =$ ___ *hours*

Correct Answers:

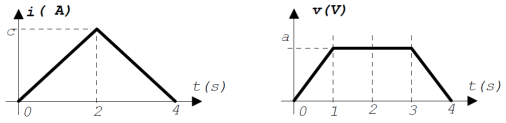
- c
- 45995.5

---

9. (12 points)

The first figure below, shows the current through a device in the interval 0 < t < 4 seconds. The second figure below shows the voltage across the same device over the same time interval. What is the total energy, in joules, absorbed by the device in those four seconds when $a = 52V$ and $c = 465A$? Assume that the current represented in the figure is flowing from high voltage to low voltage across the device.

Figure:



___ *J*

Correct Answers:

- 44330

---

10. (12 points)

For each of the following functions of time $q(t)$ that define the charge flow through an element, determine the current flowing through the element at $t = 0.34$ seconds.

(a) $q(t) = (3t + 8)\,mC$

_____ *mA*

(b) $q(t) = \left(8t^2 + 4t - 2\right)C$

_____ *A*

(c) $q(t) = \left(3e^{-t} - 5e^{-2t}\right)nC$

_____ *nA*

(d) $q(t) = (10\sin(120\pi t))\,pC$

_____ *pA*

(e) $q(t) = \left(20e^{-4t}\cos(50t)\right)\mu C$

_____ μA

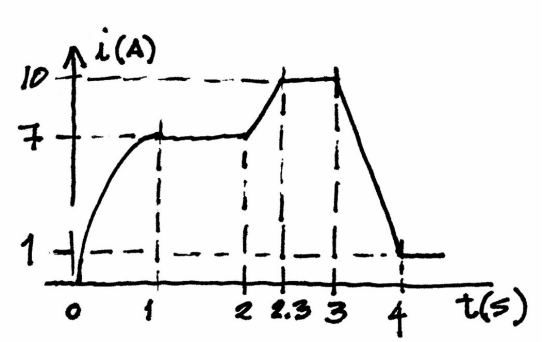
Correct Answers:

- 3
- 9.44
- 2.93086
- -3049.92
- 252.403

---

11. (12 points)

The current through an element is shown in the figure below. Determine the total charge that has passed through the element at 2.6 **seconds**.



Note: The curve between t = 0 and t = 1 is the first quarter of a sinusoidal function of time.

___ *C*

Correct Answers:

- 17.0063