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Express the KCL equations at nodes b and c in the following form:

The KCL equation can be used to find a relationship including unknown node voltages $v_b$ and $v_c$. Which expression below is correct?

A. $\frac{(V_a - V_b)}{R_1} + \frac{(V_c - V_b)}{R_3} = \frac{V_b}{R_2}$
B. $\frac{(V_b + V_a)}{R_1} + \frac{(V_c + V_b)}{R_3} = \frac{V_b}{R_2}$
C. $\frac{(-V_b - V_a)}{R_1} + \frac{(-V_c - V_b)}{R_3} = \frac{V_b}{R_2}$
D. $\frac{V_a}{R_1} + \frac{V_c}{R_3} = \frac{V_b}{R_2}$
E. $\frac{(V_a - V_b)}{R_1} + \frac{(V_c - V_b)}{R_3} = \frac{V_b}{R_2}$

Tries 0/6

Solve for a second equation by using KCL at node c (insert the known values into your equation to find the coefficients needed below):

$$ *v_b + *v_c = Is_2 = 9$$

Tries 0/6

Then solve for $v_b$ and $v_c$:

$v_b = \underline{V}$
$v_c = \underline{V}$

Tries 0/6
Find the following information about the voltage source power:
Note that $P_v = \text{minus} \ V_s1*Is1$

$P_v = \underline{\phantom{W}} \ W$

A. The voltage source is **Supplying** energy
B. The voltage source is **Absorbing** energy
C. The voltage source is **Neither** supplying nor absorbing energy

*Tries 0/6*

Find the following information about the current source power:
Note that $P_i = \text{plus} \ (v_a-v_c)*Is2$

$P_i = \underline{\phantom{W}} \ W$

A. The current source is **Supplying** energy
B. The current source is **Absorbing** energy
C. The current source is **Neither** supplying nor absorbing energy

*Tries 0/6*

---

Vs1 = 4 V Vs2 = 5 V R1 = 6 Ohms R2 = 11 Ohms R3 = 14 Ohms R4 = 5 Ohms
Use the constraints \( v_a = V_s1 \) to express the KCL equation for region X in the above circuit in terms of only one equation containing two unknowns, the node voltages \( v_b \) and \( v_c \). Notice that in that KCL, there are four currents involved for Region X (one current for each resistor); Notice the right-hand-side of the equation to make all coefficients consistent, and the equation unique too.

Equation 1 (KCL for region X):

\[
1 \times (v_b) + \quad \quad \times (v_c) = \quad \quad
\]

Tries 0/6

Using Equation 1 and the additional constraint
\( v_b - v_c = V_s2 \), solve for \( v_c \):

\[ v_c = \quad \quad \text{V} \]

Tries 0/6

Find the following information for the voltage source 1 power:

\[ P_{v1} = \begin{cases} \text{plus or minus} \end{cases} \quad V_s1 \times I_s1 \]

A. The voltage source 1 is \textbf{Supplying} energy

B. The voltage source 1 is \textbf{Absorbing} energy

C. The voltage source 1 is \textbf{Neither} supplying nor absorbing energy

Tries 0/6

Find the following information for the voltage source 2 power:

\[ P_{v2} = \begin{cases} \text{plus or minus} \end{cases} \quad V_s2 \times I_s2 \]

A. The voltage source 2 is \textbf{Supplying} energy

B. The voltage source 2 is \textbf{Absorbing} energy

C. The voltage source 2 is \textbf{Neither} supplying nor absorbing energy

Tries 0/6
HW6

Which of the following is the typical "power and ground" configuration of a DIP package?

A. A.
B. B.
C. C.
D. D.
E. E.

Tries 0/2

Replacement of the 10 kΩ resistor by a certain flex sensor with a range of 30 kΩ through 60 kΩ will theoretically have what effect on the circuit waveform at node C?

A. The duty cycle will change.
B. The frequency will change.
C. The period will change.
D. Both the frequency and the period will change.
E. None of these is true.

Tries 0/2
Treat both diodes with the offset-ideal model having a $V_{on}$ of 0.7 Volts.

Which of the two diodes is ON? Check the one correct statement below, for each case:

Choices: On, Off, cannot tell—we make a guess.
- Left Diode
- Right Diode

Tries 0/6

What is the current in the ON diode? A

Tries 0/6
Treat both diodes with the offset-ideal model having a $V_{on}$ of 0.7 Volts.

Choices: Yes, No, cannot tell—we make a guess.
- Does current flow freely through the resistor?

Tries 0/6
Treat all diodes with the offset-ideal model having a $V_{on}$ of 0.7 Volts.

Choices: Yes, No, cannot tell-we make a guess.
- Does current flow freely through the resistor?

Tries 0/6
Which of the diodes is ON? Treat both diodes with the offset-ideal model having a $V_{on}$ of 0.2 Volts.

A. Both the top and bottom diodes are OFF.
B. Both the top and bottom diodes are ON (and conducting current).
C. The top diode is OFF and the bottom diode is ON (and conducting current).
D. The top diode is ON (and conducting current) and the bottom diode is OFF.

Tries 0/6

What resistance (in ohms) must the current limiting resistor have if the diode’s $V_{on}$ = 2 Volts and the current through the diode is 20 mA? NOTE: An LED has a larger $V_{on}$ than the non-light-emitting silicon and germanium diodes.
Under the (large-signal) offset-ideal model, which of the following is true?

A. An offset-ideal model diode absorbs energy when ON.
B. An offset-ideal model diode never absorbs energy.
C. An offset-ideal model diode absorbs energy when off or on, but more when on.

Tries 0/2

In the offset-ideal model, when a diode is OFF, it acts like...

A. an open circuit.
B. a perfect conductor.
C. a resistor.
D. a circuit element with $V_d = -V_{on}$.

Tries 0/2

A red LED with $V_{on} = 2 \, \text{V}$ is to be operated with a $14 \, \text{mA}$ current. What value of $R$ should be used if the voltage supply provides $V_s = 4.5 \, \text{V}$?

$$R = \Omega$$

Tries 0/6
Consider the following circuit:

\[ V_1 = 6.9 \text{ V}, \quad R_1 = 2 \text{ k}\Omega, \quad \text{and} \quad R_2 = 2.9 \text{ k}\Omega. \]

Before you start computations on this problem, think what region you should assume for the diode: On (and conducting)? Off?

Using the offset-ideal model in which the voltage across a forward-biased silicon diode is 0.65 V, find:

a) the value of the current \( i_{R2} \) (in mA) through the resistor \( R_2 \) (hint: you should use KVL, and Ohm’s law):
\[
i_{R2} = \text{mA}
\]

\( Tries \ 0/6 \)

b) the value of the current \( i_{R1} \) (in mA) through the resistor \( R_1 \) (hint: you should use KVL, and Ohm’s law):
\[
i_{R1} = \text{mA}
\]

\( Tries \ 0/6 \)

c) the value of the current \( i_d \) (in mA) through the diode (hint: you should use KCL):
\[
i_d = \text{mA}
\]

d) Now check the validity of your answers \( (v_d, i_d) \): is the diode in the on state or the off state?
   A. On and conducting
   B. Off

\( Tries \ 0/6 \)
When a diode is forward biased above its nominal "turn-on" voltage, it is said to be on. When biased below the turn-on voltage, it is said to be "off". Help John Genius make an educated initial assumption about the operating region of each diode in the circuit below.

Check the one correct statement below, for each case:

Choices: On, Off, cannot tell-we make a guess.
- For diode D1
- For diode D2
- For diode D3

Tries 0/6
Help John Genius make an educated initial assumption about the operating region of each diode in the circuit below.

Check the one correct statement below, for each case:

Choices: On, Off, cannot tell—we make a guess.
- For diode D1
- For diode D2
- For diode D3

Tries 0/6
It is given that \( V_{\text{clip}} = 3 \text{ V}, \ R = 18 \ \Omega, \ \text{and} \ V_{\text{on}} = 2 \text{ V} \) for the diode (assume offset-ideal model). Suppose \( V_s \) can take any value from -10 to +10 V. What are the maximum and minimum values that \( V_{\text{out}} \) might take on?

maximum \( V_{\text{out}} = \boxed{\text{V}} \)

minimum \( V_{\text{out}} = \boxed{\text{V}} \)

*Tries 0/6*
It is given that $V_{\text{clip}} = 3 \text{ V}$, $R = 20 \ \Omega$, and $V_{\text{on}} = 2 \text{ V}$ for the diode (assume offset-ideal model). Suppose $V_s$ can take any value from $-10$ to $+10 \text{ V}$. What are the maximum and minimum values that $V_{\text{out}}$ might take on?

maximum $V_{\text{out}} =$ [ ] V

minimum $V_{\text{out}} =$ [ ] V

Tries 0/6
It is given that $V_{\text{clip}} = -4 \text{ V}$ (note the negative sign!), $R = 20 \ \Omega$, and $V_{\text{on}} = 2 \text{ V}$ for the diode (assume offset-ideal model). Suppose $V_s$ can take any value from $-10$ to $+10 \text{ V}$. What are the maximum and minimum values that $V_{\text{out}}$ might take on?

Maximum $V_{\text{out}} = \square \text{ V}$

Minimum $V_{\text{out}} = \square \text{ V}$

Tries 0/6