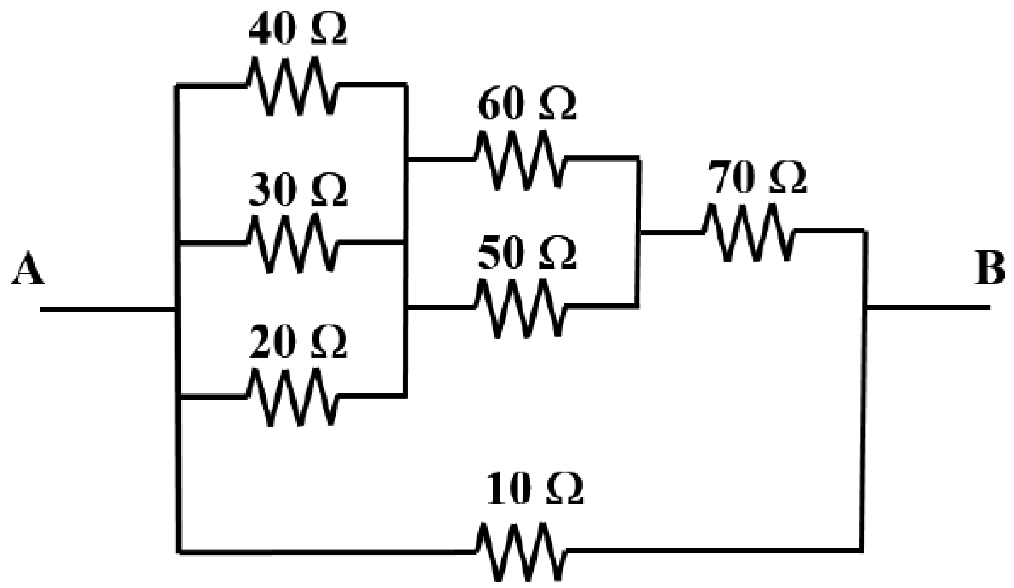
CG1111A:
Engineering Principles & Practice I

Revision Practice Questions for Quiz #1

NUS
National University of Singapore

Q1



For the resistor network shown in the figure above, what is the equivalent resistance R_{AB} between the terminals A and B?

(A) 9.14 Ω

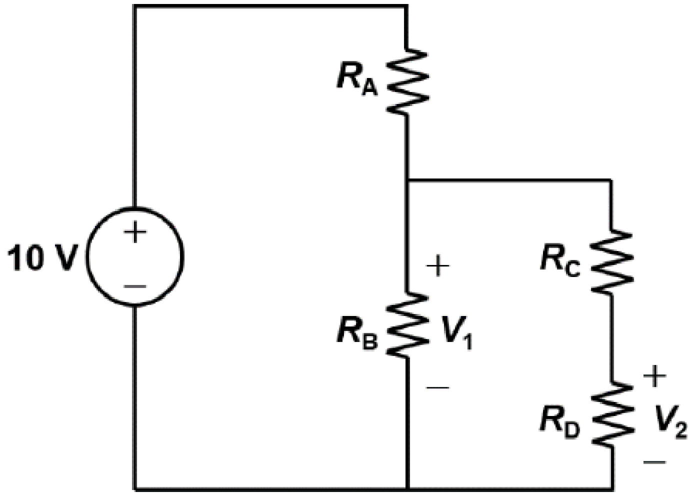
(B) 10.94 Ω

(C) 106.5 Ω

(D) 116.5 Ω

Ans: A

Q2

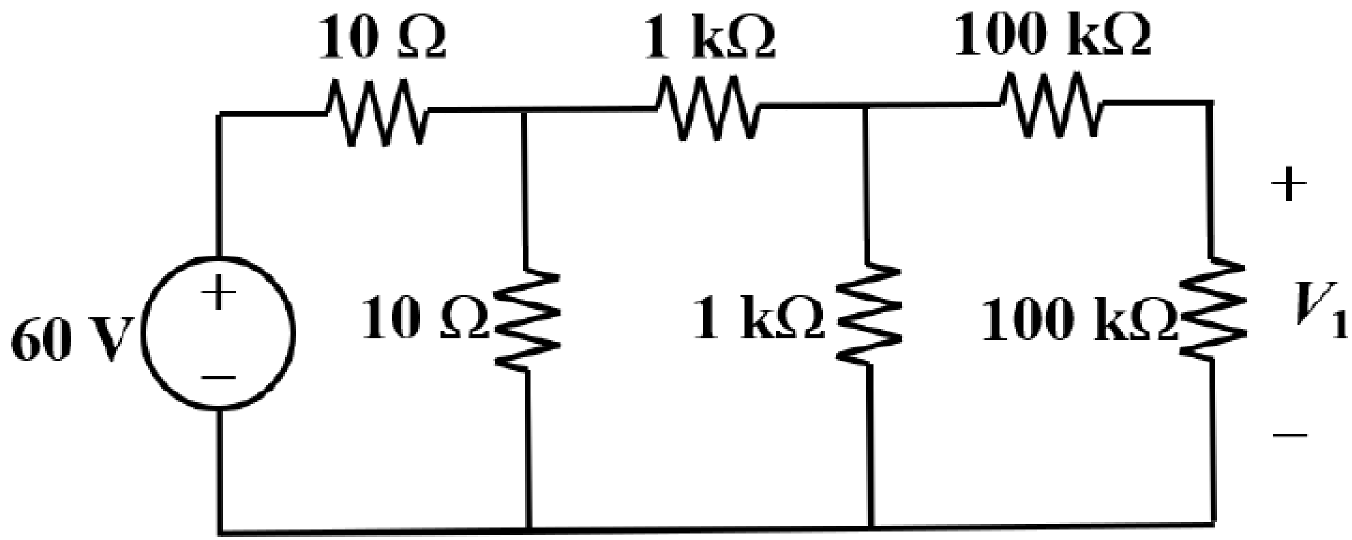


Benedict, who'd just learnt about the voltage divider principle, is excited about applying it to build a circuit shown in the figure above. He wishes to obtain V_1 = 6 V, and V_2 = 2 V. However, he does not realize that he cannot apply the principle directly to R_A and R_B, as resistors R_C and R_D have a "loading effect". Which one of the following sets of resistor values would allow him to get V_1 and V_2 to be closest to his desired voltages of 6 V and 2 V, respectively?

	R_A	R_B	R_C	R_D
(A)	40 Ω	60 Ω	400 Ω	200 Ω
(B)	40 Ω	60 Ω	4000 Ω	2000 Ω
(C)	400 Ω	600 Ω	40 Ω	20 Ω
(D)	4000 Ω	6000 Ω	40 Ω	20 Ω

Ans: B

Q3



For the circuit shown in the figure above, what is the voltage V_1?

A: 5.4 V

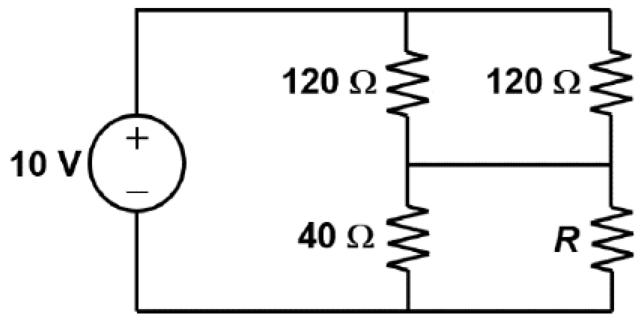
B: 7.5 V

C: 15.0 V

D: 30.0 V

Ans: B (most common mistakes: C and D)

Q4



What is the value of *R* that will result in a current of 0.1 A passing through *R*?
(Hint: Use Thevenin equivalent circuit)

(A) 56 Ω

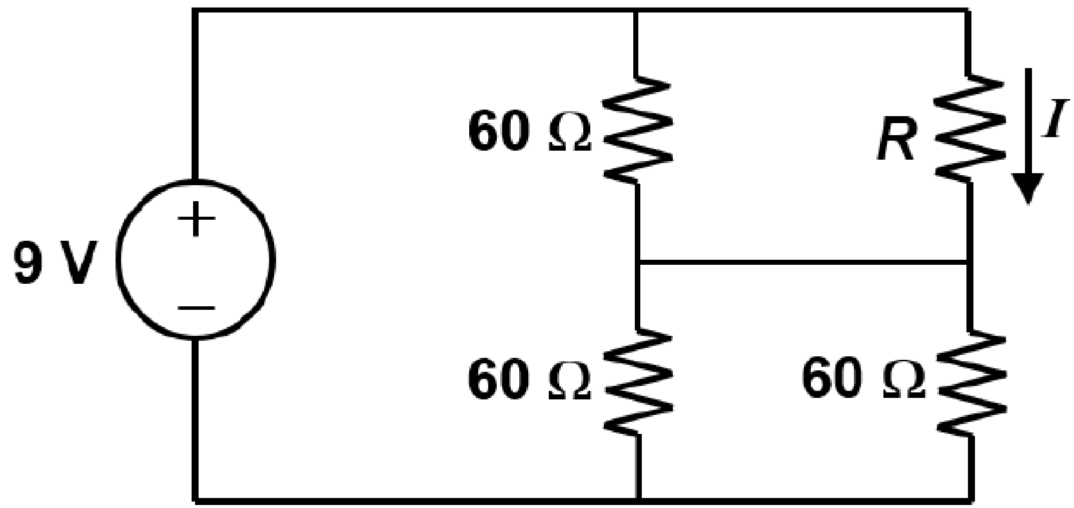
(B) 24 Ω

(C) 40 Ω

(D) 16 Ω

Ans: D

Q5

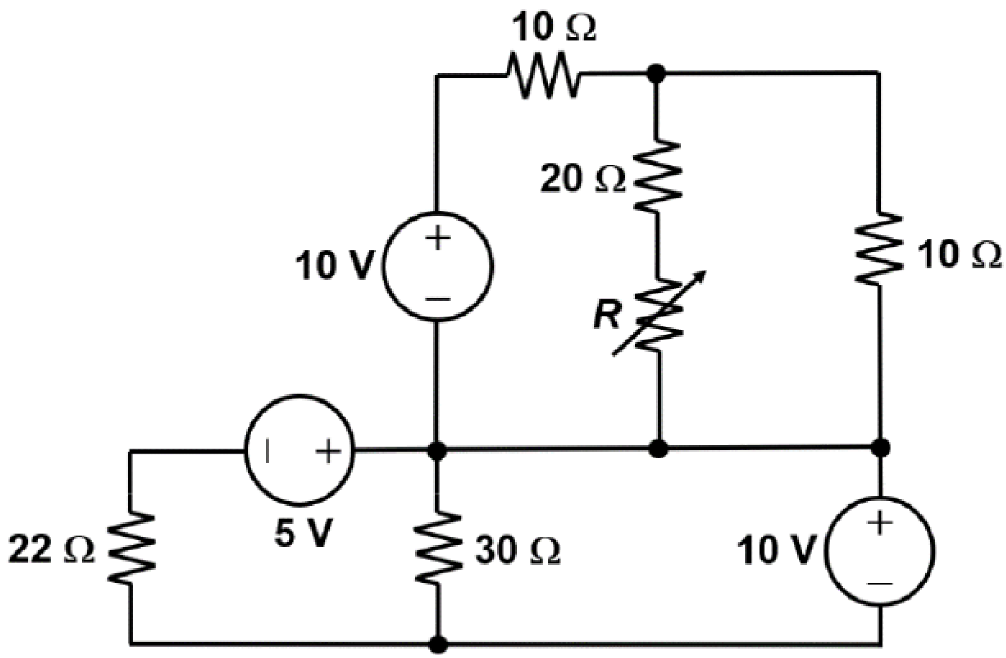


What is the value of R that will result in a current of I = 0.15 A passing through R?
(Hint: Use Thevenin equivalent circuit)

A: 60 Ω
B: 40 Ω
C: 30 Ω
D: 20 Ω

Ans: D (most common mistake: B)

Q6



What is this maximum power that can be utilized by the load R?

(A) 0.25 W

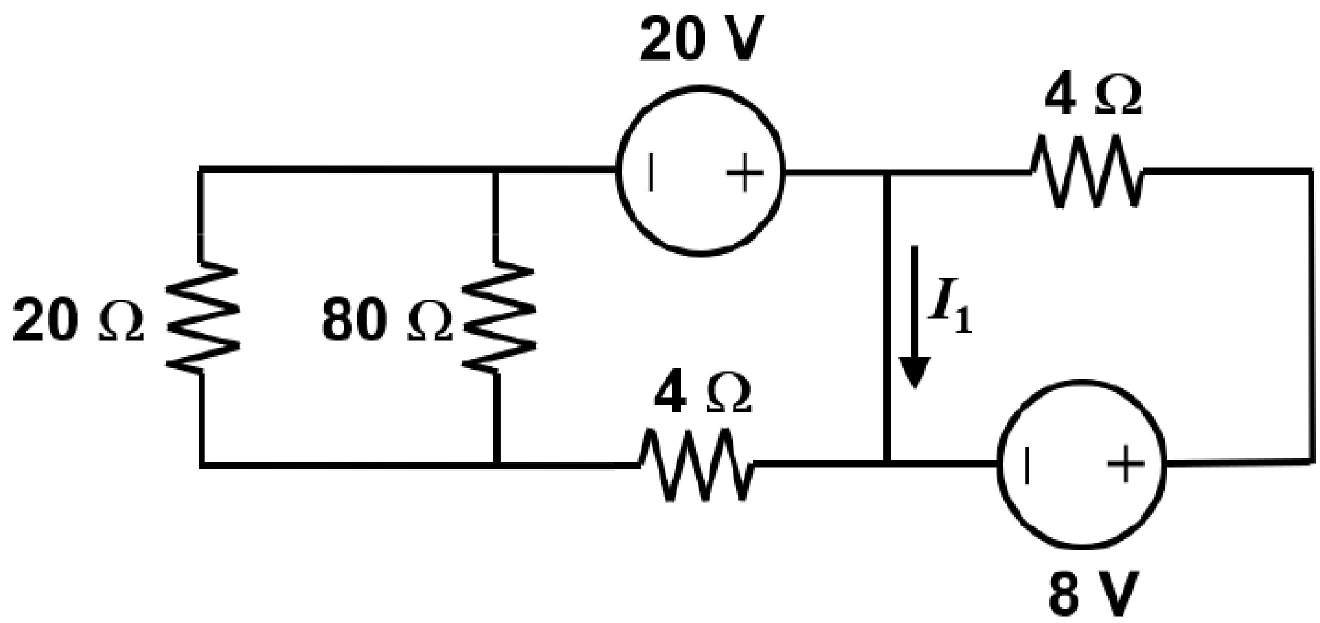
(B) 1 W

(C) 1.56 W

(D) 6.25 W

Ans: A

Q7

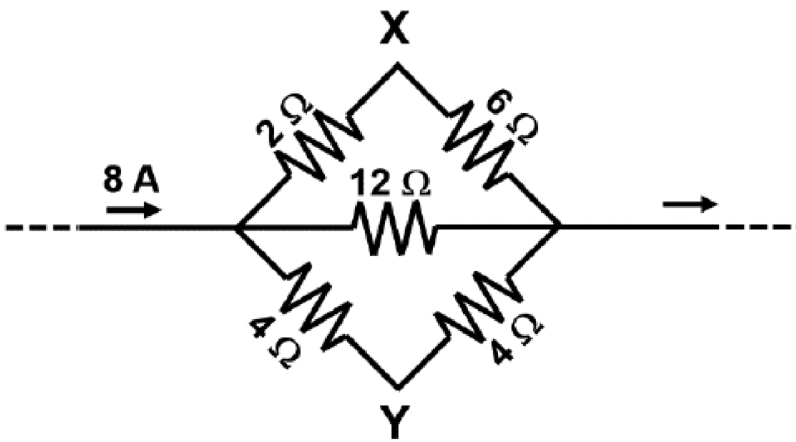


For the circuit shown in the figure above, what is the value of current I_1?

A: 0 A
B: 1 A
C: 2 A
D: 3 A

Ans: D (most common mistake: B)

Q8



A current of 8 A flows through a resistor network as shown in the figure above. The voltage difference V_{XY} (given by $V_X - V_Y$) is

(A) 12 V

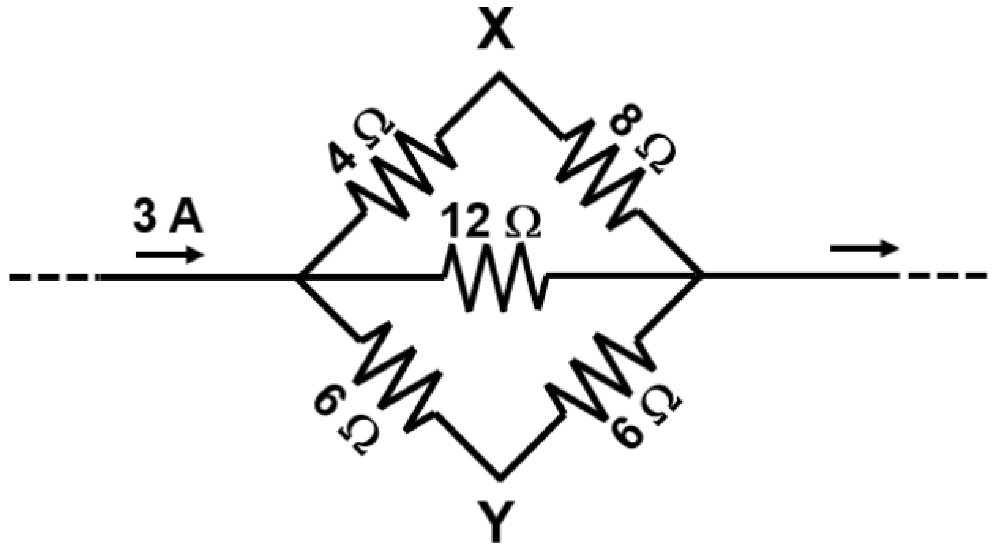
(B) 6 V

(C) 4.57 V

(D) 11.4 V

Ans: B

Q9

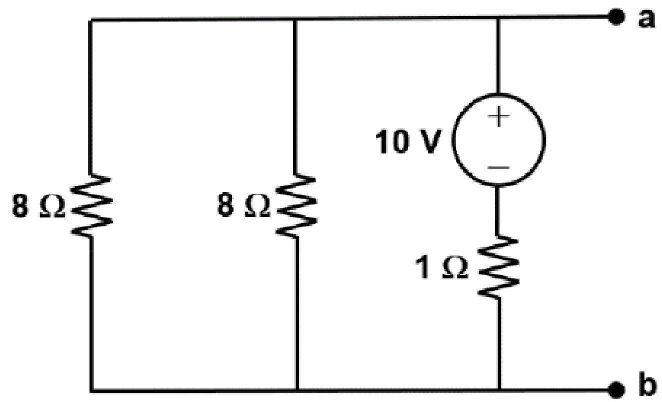


A current of 3 A flows through a resistor network as shown in the figure above. The voltage difference V_{XY} (given by $V_X - V_Y$) is

A: 2 V
B: −2 V
C: 5 V
D: 8 V

Ans: A (most common mistake: B)

Q10



Suppose a load resistance R_L is to be placed across the nodes **a** and **b** in the circuit above, so as to draw maximum power. What is this maximum power that can be utilized by the load R_L?

(A) 10 W

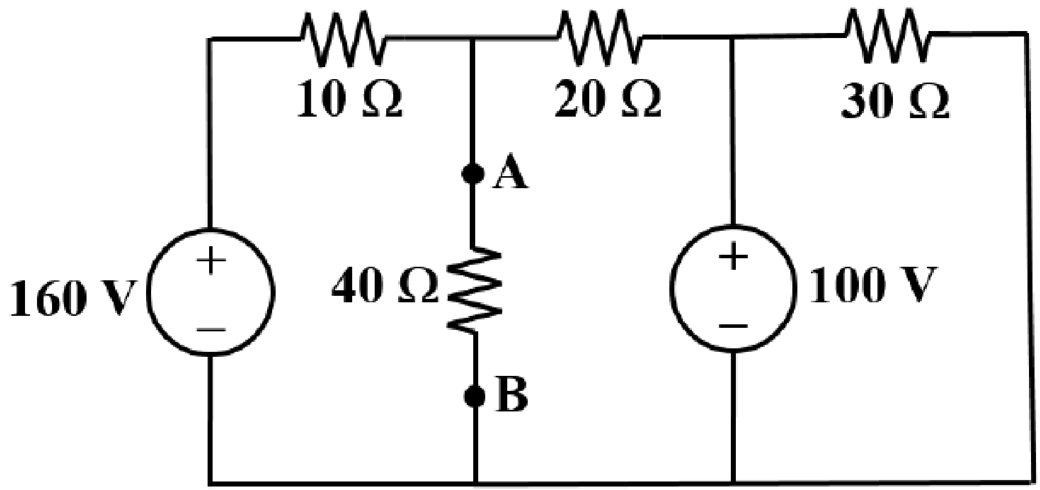
(B) 20 W

(C) 40 W

(D) 80 W

Ans: B

Q11



For the circuit shown in the figure above, what is the Thevenin equivalent circuit as seen by the 40 Ω resistor (i.e., between nodes A and B)?

(A) $V_T = 120$ V, $R_T = 6.67\ \Omega$

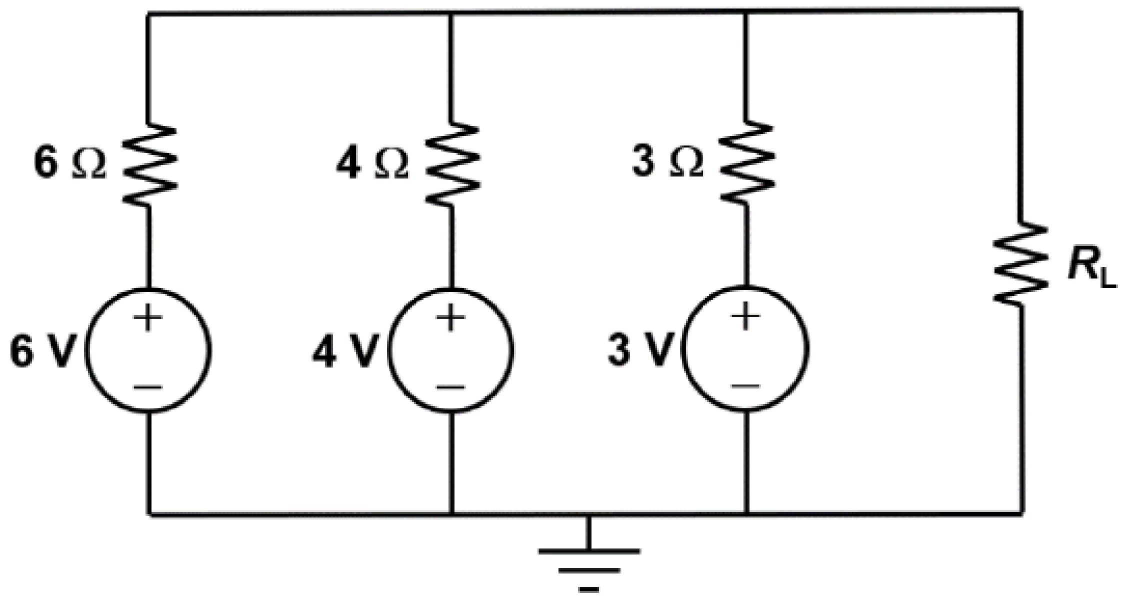
(B) $V_T = 140$ V, $R_T = 6.67\ \Omega$

(C) $V_T = 120$ V, $R_T = 5.45\ \Omega$

(D) $V_T = 140$ V, $R_T = 5.45\ \Omega$

Ans: B

Q12

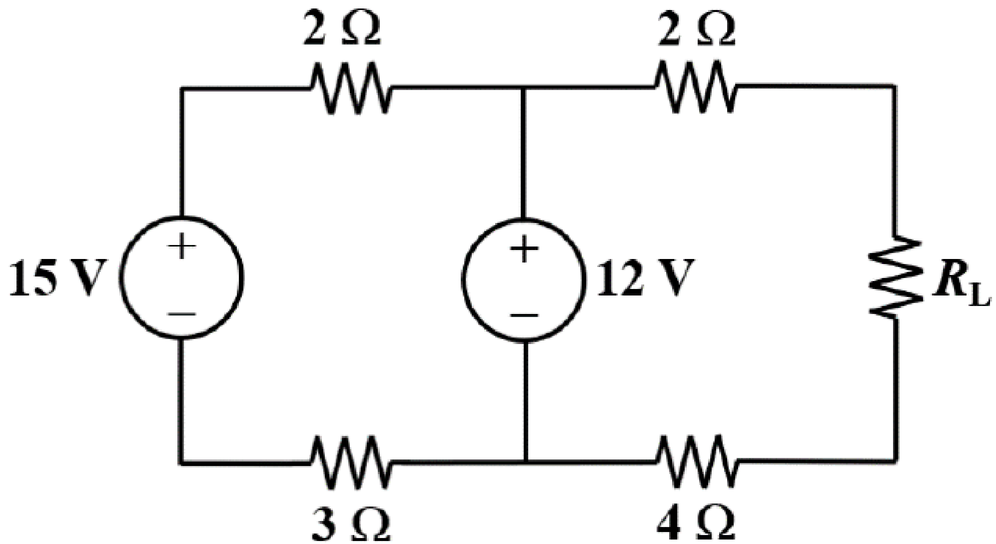


For the circuit shown in the figure above, what is the Thevenin equivalent circuit's *Thevenin voltage* as seen by the load R_L?

A: 4 V
B: 2.4 V
C: 4.56 V
D: 4.28 V

Ans: A (most common mistake: uniform for the other 3 options... random guesses!)

Q13

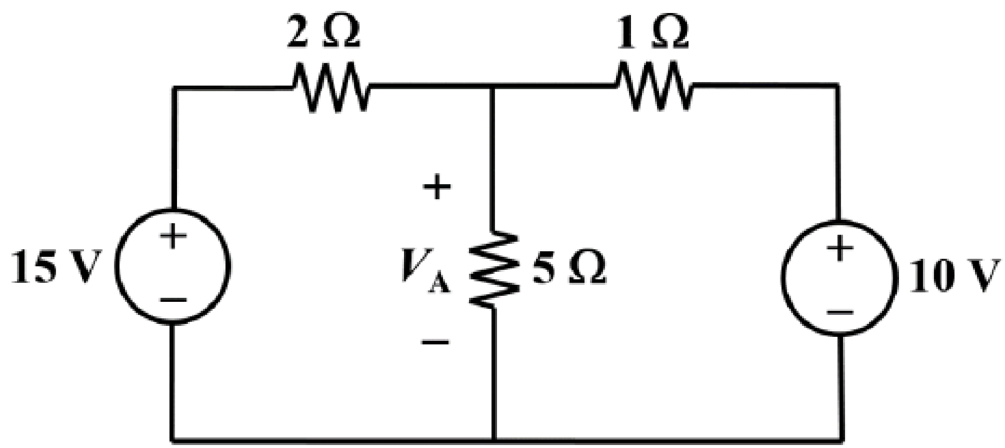


For the circuit shown in the figure above, what is the Thevenin equivalent circuit's *Thevenin resistance* as seen by the load R_L?

A: 6 Ω
B: 1.33 Ω
C: 7.2 Ω
D: 2.53 Ω

Ans: A (most common mistake: D)

Q14



For the circuit shown in the figure above, what is the voltage V_A?

(A) 12.1 V

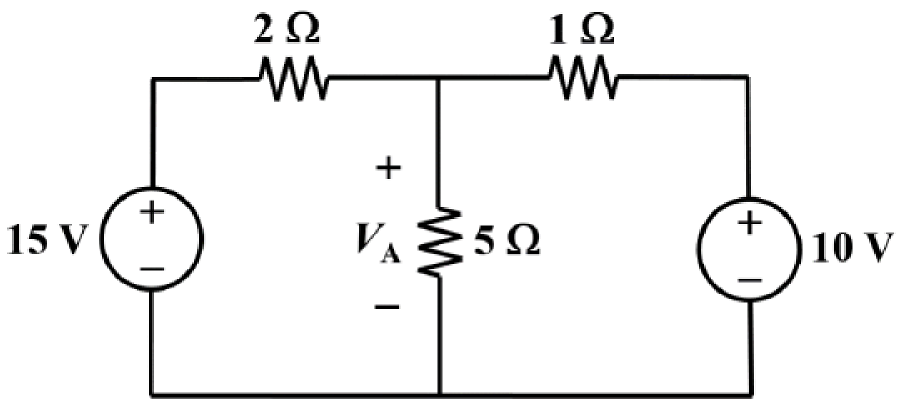
(B) 11.7 V

(C) 11.3 V

(D) 10.3 V

Ans: D

Q15



For the circuit shown in the figure above, the 10 V voltage source is

(A) supplying a power of about 28 W.

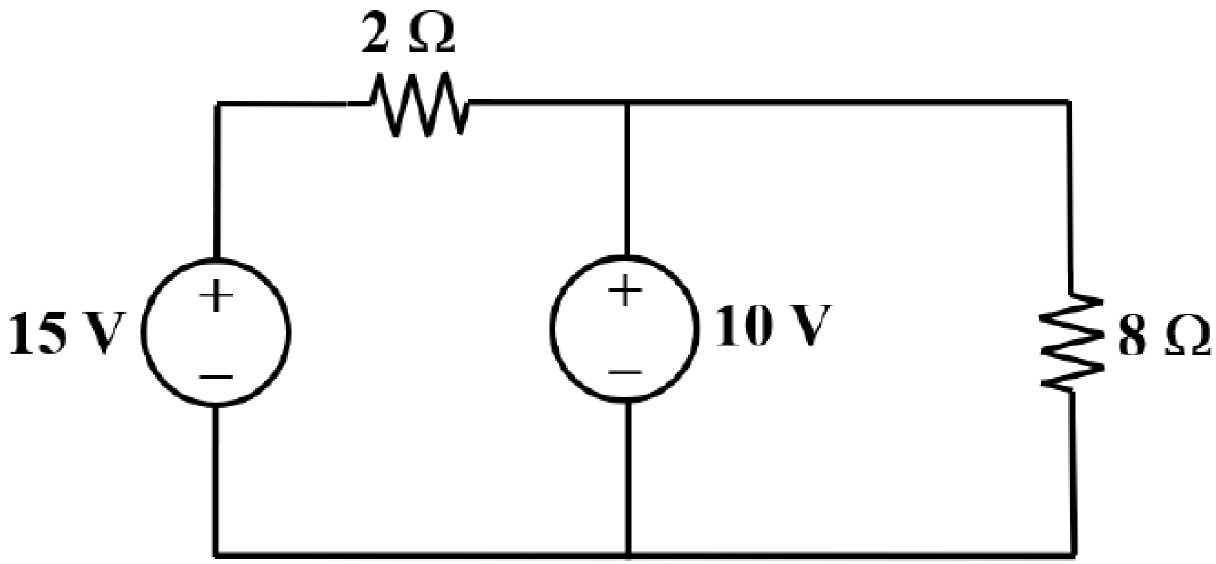
(B) consuming a power of about 21 W.

(C) consuming a power of about 3 W.

(D) consuming a power of about 13 W.

Ans: C

Q16

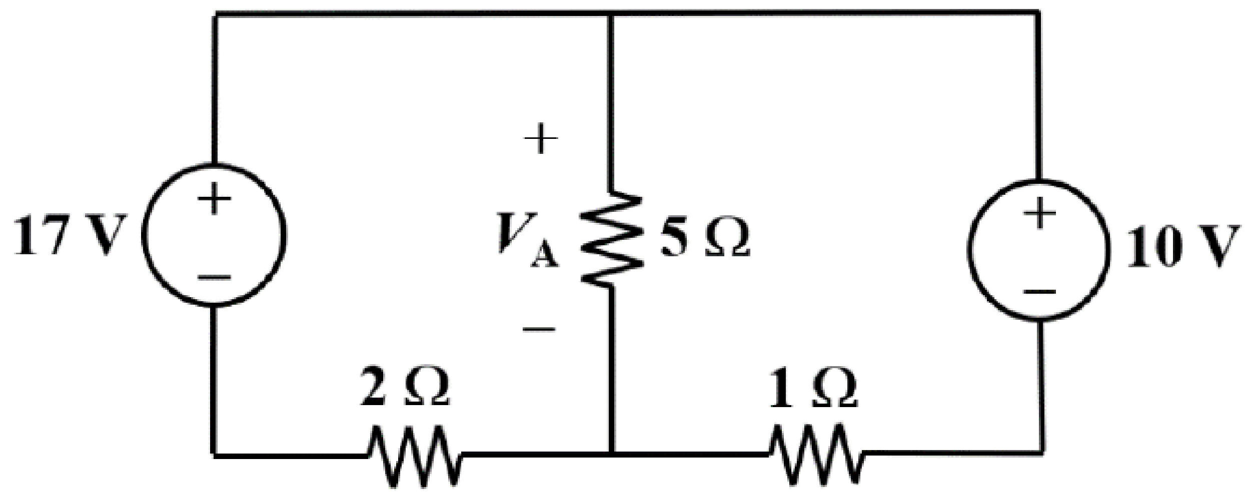


For the circuit shown in the figure above, the 10 V voltage source is

A: consuming a power of 12.5 W.
B: supplying a power of 12.5 W.
C: supplying a power of 37.5 W.
D: consuming a power of 25 W.

Ans: A (most common mistake: D)

Q17

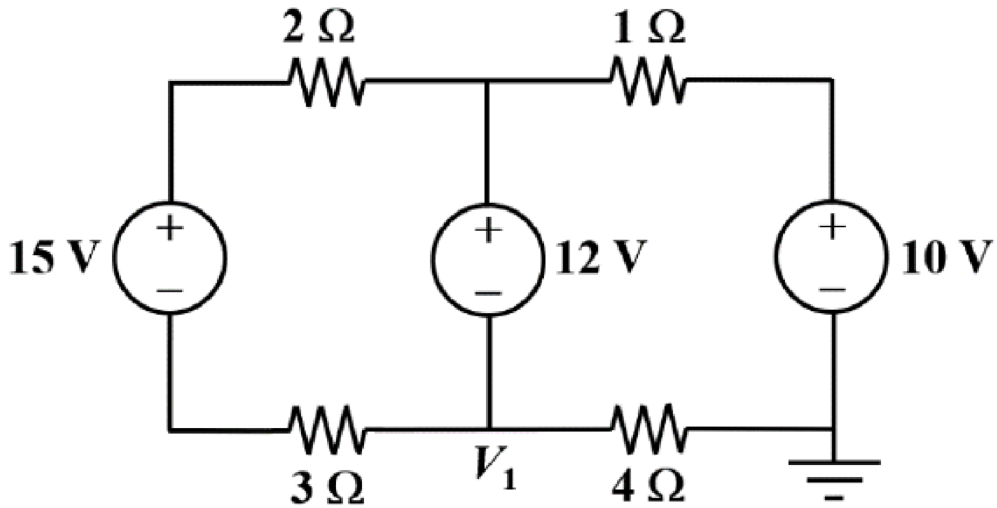


For the circuit shown in the figure above, what is the voltage V_A?

A: 10.9 V
B: 11.9 V
C: 12.3 V
D: 12.7 V

Ans: A (most common mistake: C)

Q18



For the circuit shown in the figure above, what is the voltage V_1 with respect to ground?

(A) 3.4 V

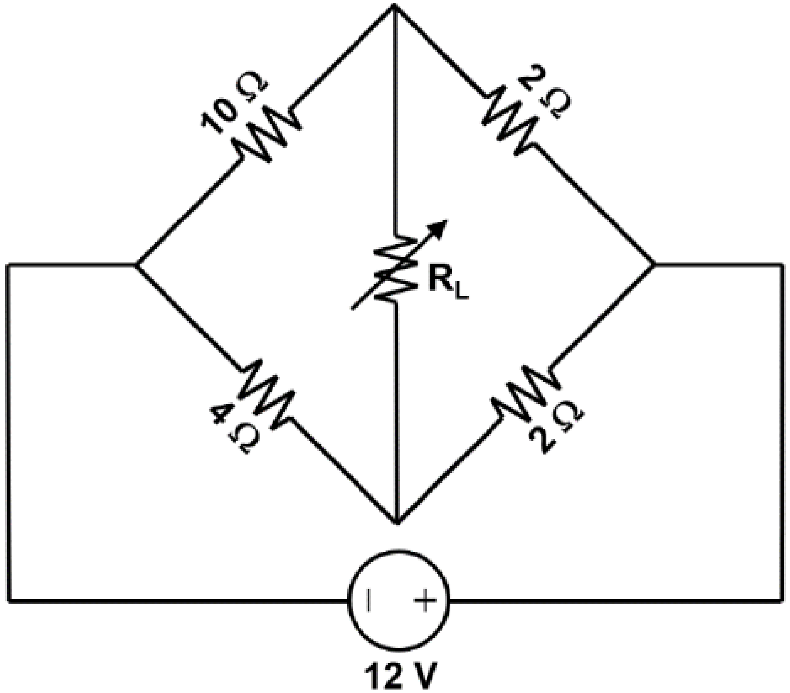
(B) –3.4 V

(C) 1.6 V

(D) –1.6 V

Ans: D

Q19

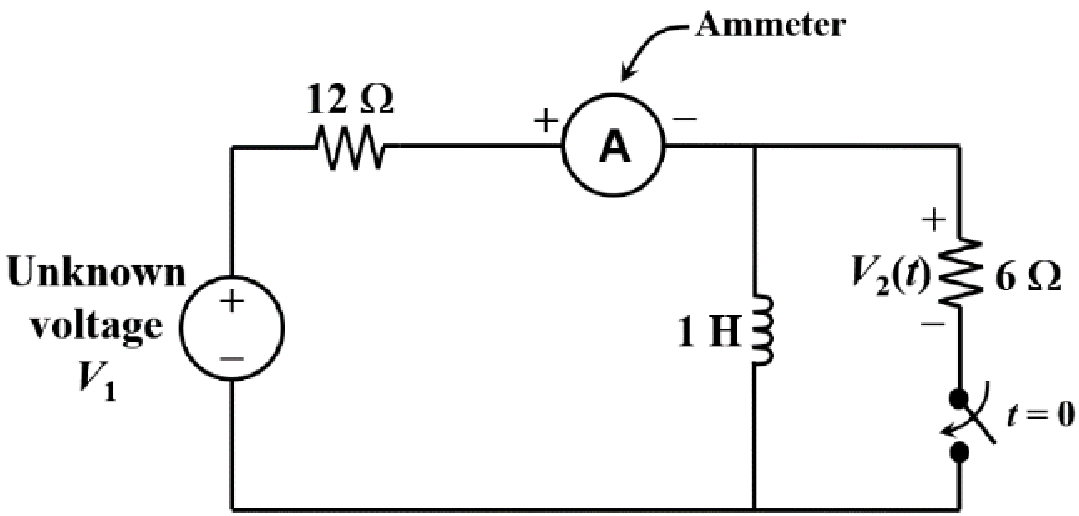


What is the maximum power that can be utilized by the variable load R_L?

A: 333 mW
B: 1.33 W
C: 4 W
D: 259 mW

Ans: A (most common mistake: B)

Q20



For the circuit shown in the figure above, the switch has been opened for a long time, and the current measured by the ammeter was 1 A before time $t = 0$. At time $t = 0$, the switch is closed. What would be the voltage $V_2(t)$ at time $t = 0^+$ s?

(A) 0 V

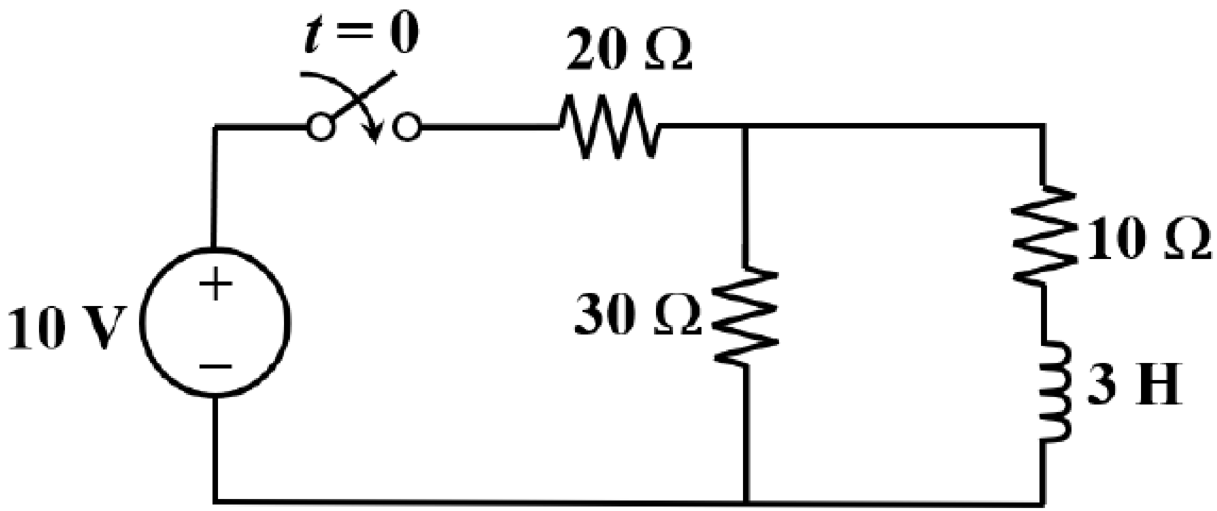
(B) –6 V

(C) 4 V

(D) 6 V

Ans: A

Q21

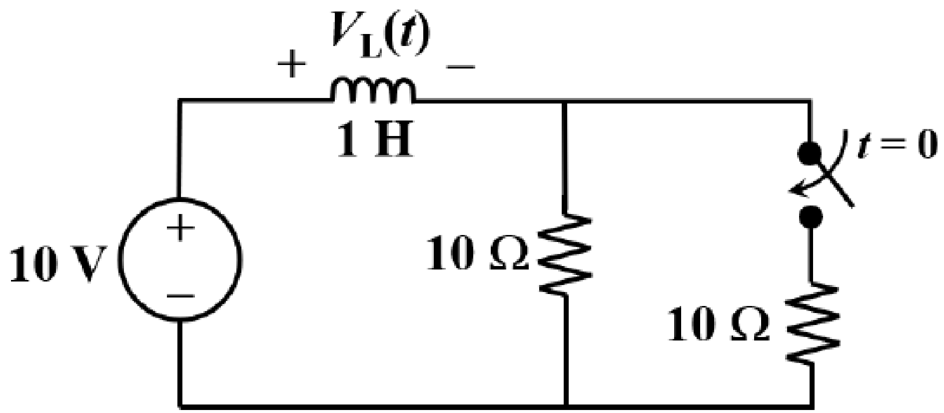


What is the time constant (τ) for the inductor's current after t = 0?

A: 136 ms
B: 109 ms
C: 50 ms
D: 81.8 ms

Ans: A (most common mistake: B)

Q22



In the circuit shown in the figure above, the switch was initially OPEN for a long time. At time t = 0, the switch is closed. What is the inductor's voltage $V_L(t)$ at time t = 0.2 s?

(A) 8.16 V

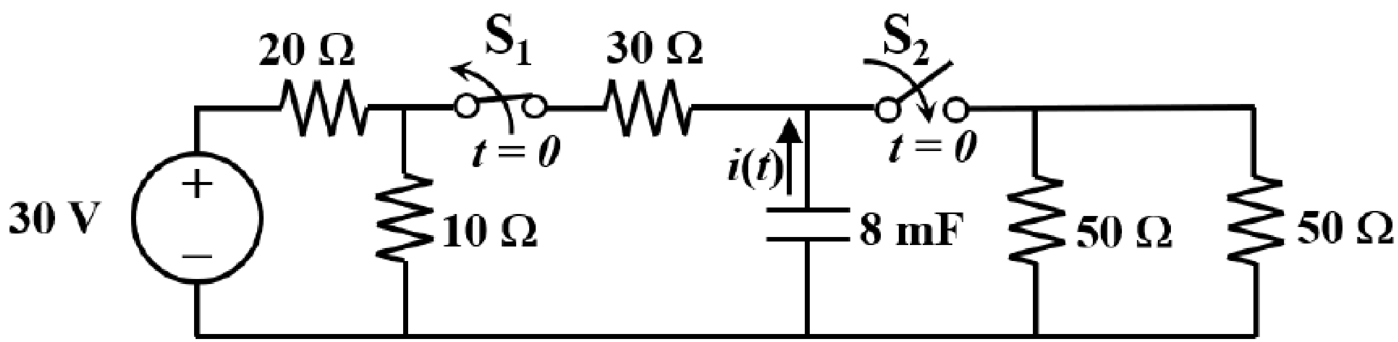
(B) 1.84 V

(C) 6.32 V

(D) 3.68 V

Ans: B

Q23



In the circuit shown in the figure above, switch S_1 was CLOSED and switch S_2 was OPEN for a long time before time $t = 0$. At time $t = 0$, both switches are flipped (i.e., S_1 becomes OPEN, and S_2 becomes CLOSED). What is the capacitor's current $i(t)$ at time $t = 0.2$ second?

(A) 0.147 A

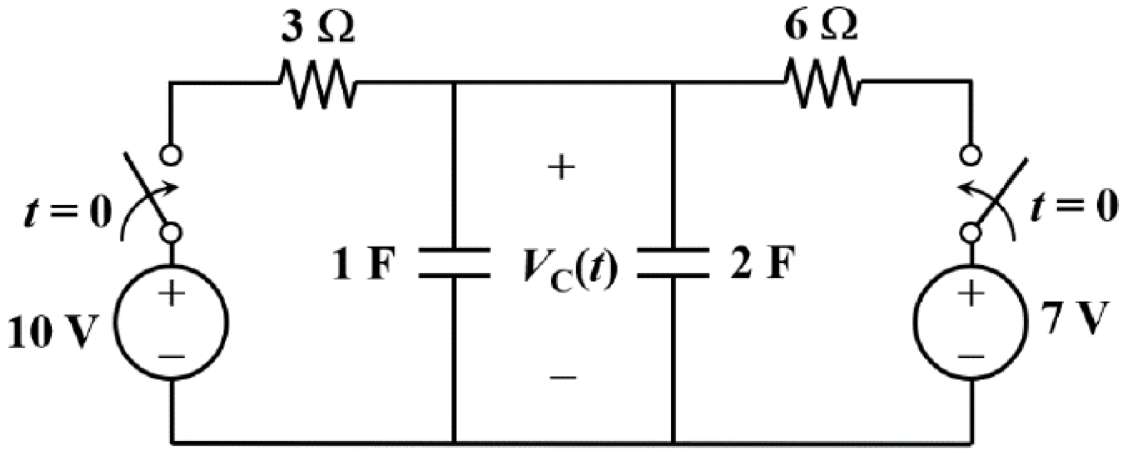
(B) 0.253 A

(C) 3.68 A

(D) 73.6 mA

Ans: A

Q24

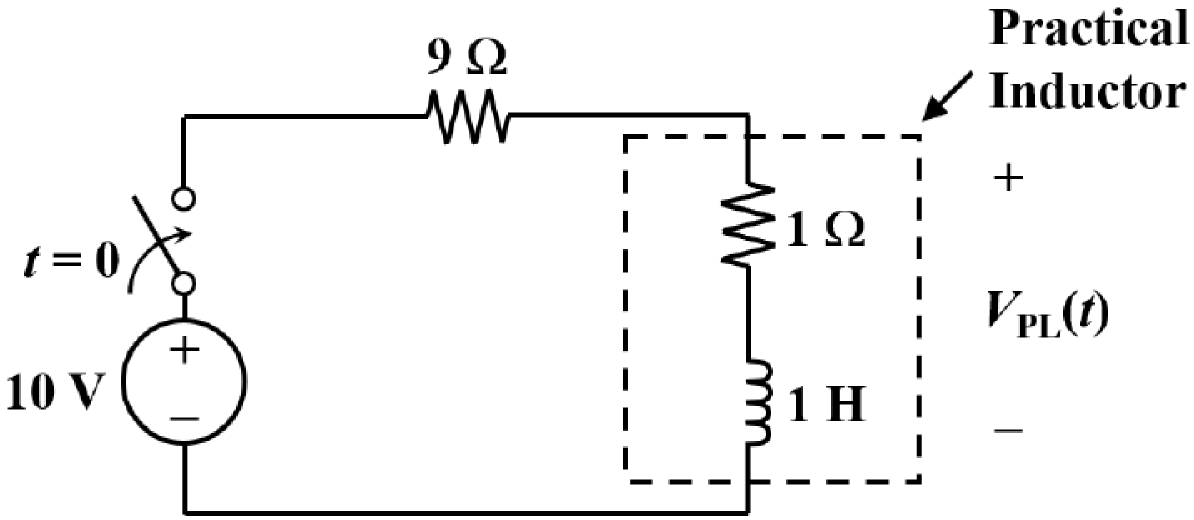


In the circuit shown in the figure above, the two capacitors were fully discharged initially. At time t = 0, both the switches are closed simultaneously. How long does it take for the voltage $V_c(t)$ to reach 5 V?

A: 4.9 s
B: 7.4 s
C: 22.1 s
D: 1.6 s

Ans: A (most common mistake: B and D)

Q25

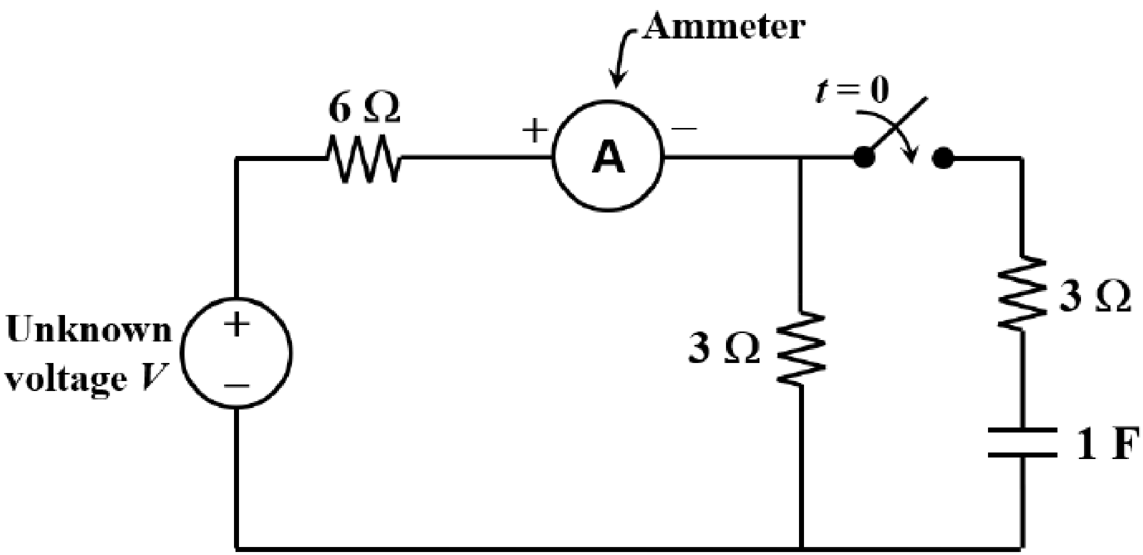


In the circuit shown in the figure above, the switch was initially OPEN for a long time. At time t = 0, the switch is closed. What is the practical inductor's voltage $V_{PL}(t)$ at time t = 0.1 s?

A: 4.31 V
B: 0.63 V
C: 5.69 V
D: 1.00 V

Ans: A (most common mistake: B)

Q26

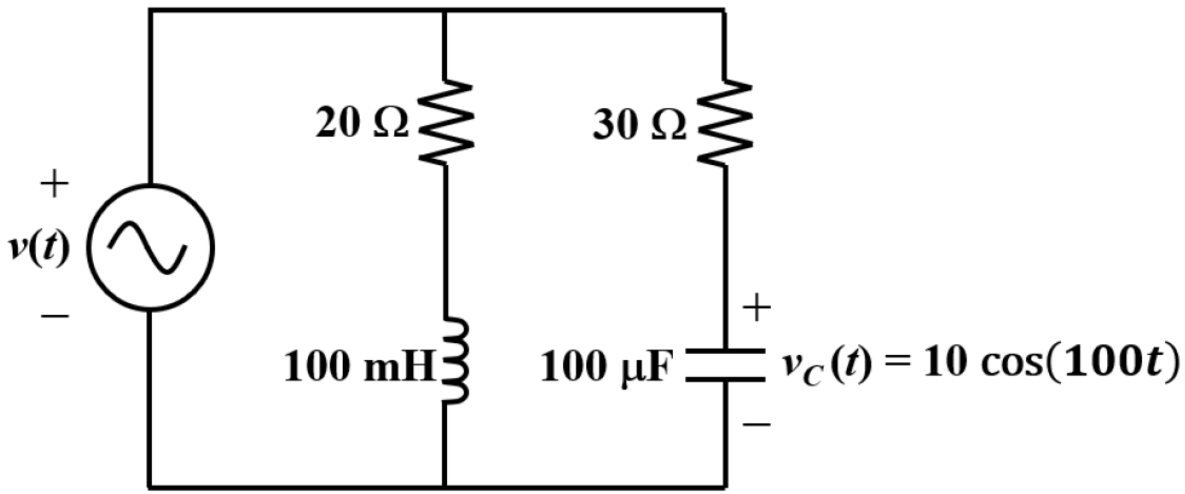


In the circuit shown in the figure above, the capacitor was fully discharged initially, and the current measured by the ammeter was 2 A before time t = 0. At time t = 0, the switch is closed. What would be the ammeter's reading at time t = 5 s?

A: 2.15 A
B: 2.00 A
C: 3.00 A
D: 2.37 A

Ans: A (most common mistake: D)

Q27



In the circuit shown in the figure above, the voltage $v(t)$ is

(A) $9.58 \cos(100t - 16.7°)$ V

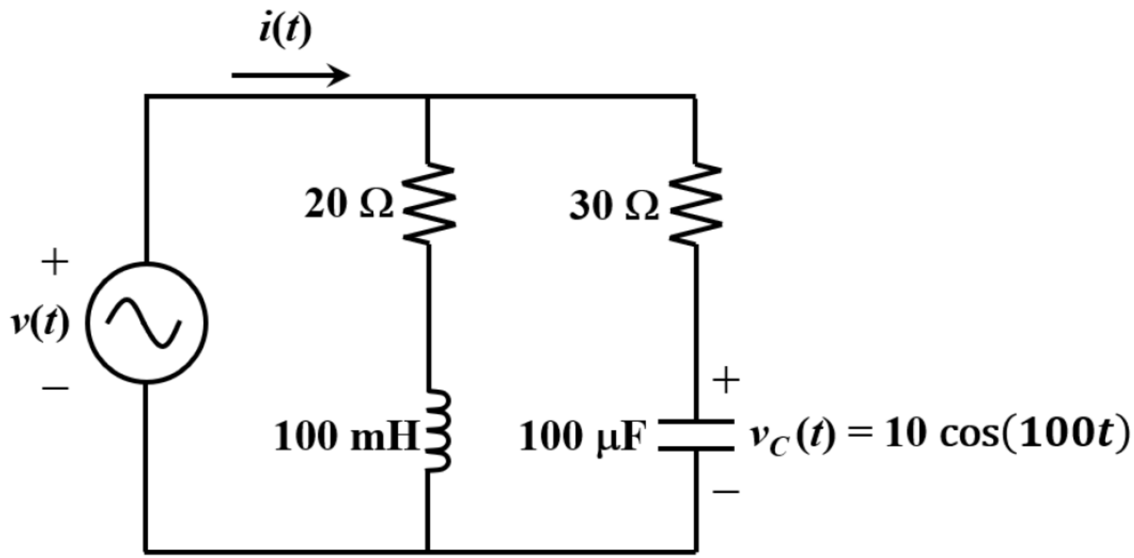
(B) $9.58 \cos(100t + 16.7°)$ V

(C) $10.4 \cos(100t + 16.7°)$ V

(D) $10.4 \cos(100t - 16.7°)$ V

Ans: C

Q28



In the circuit shown in the figure above, the current $i(t)$ is

(A) $237\cos(100t + 30.9°)$ A

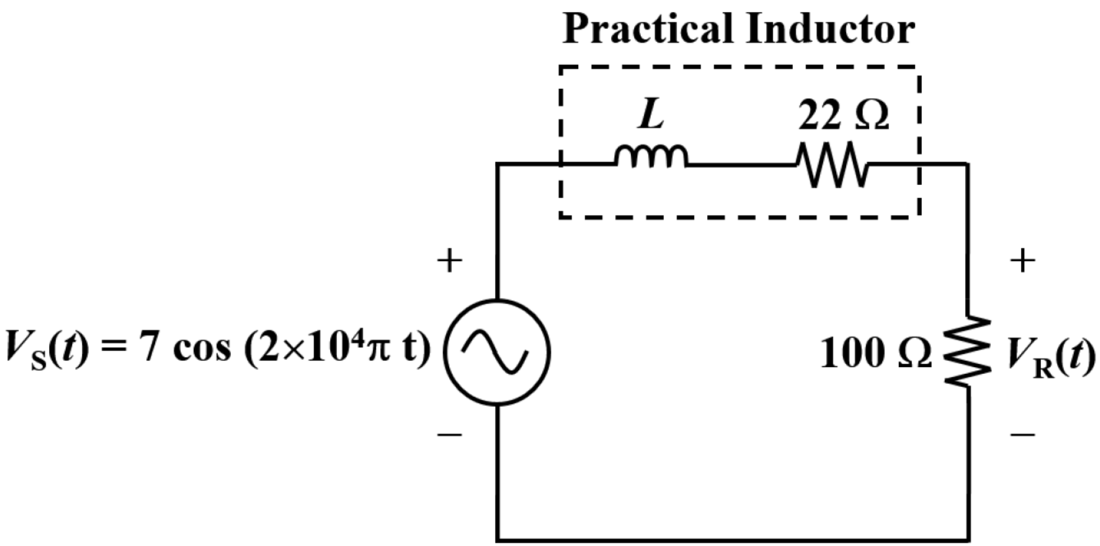
(B) $2.17\cos(100t - 2.5°)$ A

(C) $0.46\cos(100t + 2.5°)$ A

(D) $0.54\cos(100t - 17.6°)$ A

Ans: C

Q29



In the circuit shown in the figure above, a 100 Ω resistor is connected in series with a practical inductor. The practical inductor has a resistance of 22 Ω, and an unknown inductance L. Suppose the phase angle of the voltage $V_R(t)$ is found to be −67° with respect to the source voltage $V_S(t)$, the inductance L can be obtained as:

(A) 0.825 mH

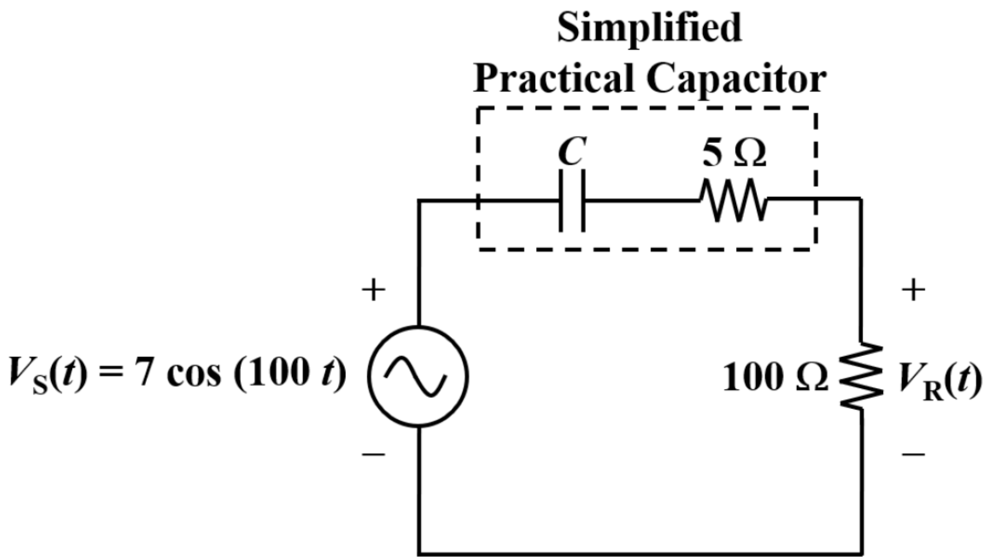
(B) 3.75 mH

(C) 4.57 mH

(D) 5.88 mH

Ans: C

Q30



In the circuit shown in the figure above, a 100 Ω resistor is connected in series with a practical capacitor. The practical capacitor has a series resistance of 5 Ω, and an unknown capacitance C. Suppose the phase angle of the voltage $V_R(t)$ is found to be 43.6° with respect to the source voltage $V_S(t)$, the capacitance C can be obtained as:

(A) 10 μF

(B) 100 μF

(C) 1 mF

(D) 10 mF

Ans: B