ECE 35, Fall 2021

Your sequence number

Last name

First + middle name(s)

PID

Quiz 1

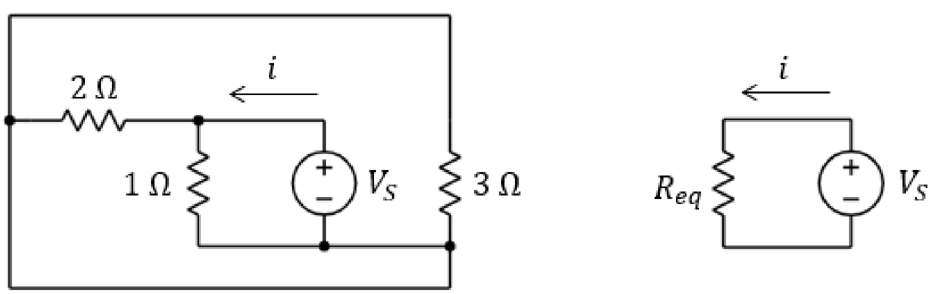
/ 13

Instructions:

- Read each problem completely and thoroughly before beginning
- All calculations need to be done on these sheets
- Write your answers in the answer boxes for each question. <u>Make sure you list units!</u>
- Answers without supporting calculations will receive zero credit

(1) Find the equivalent resistance R_{eq} such that for the same V_S the current i is the same in both circuits. *(2 points)*

R_{eq}



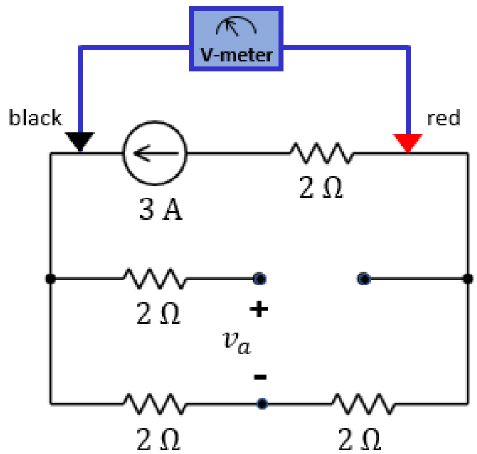
(2) In the problem below, the voltmeter is ideal.

(a) What is the reading *X* of the voltmeter? *(2 points)*

(b) What is the value of the voltage v_a? *(2 points)*

X ☐

v_a ☐



(3) (a) What is the power P_1 <u>received</u> by the <u>independent voltage source</u>? *(1 point)*

P_1 ☐

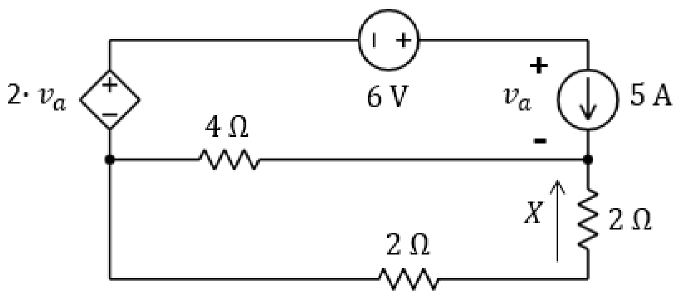
(b) What is the power P_2 <u>received</u> by the <u>dependent voltage source</u>? *(2 points)*

P_2 ☐

(c) What is the value of the current X? *(2 points)*

X ☐

(d) Redraw the circuit and include an (ideal) ammeter that allows you to measure the current X. Make sure you indicate where the red and black terminals are. *(2 points)*



ECE35 Equation Sheet

Basics: $i \triangleq \dfrac{dq}{dt}$ $\quad v_{ab} \triangleq \dfrac{dw}{dq}$ $\quad R = \rho \dfrac{l}{A}$

Capacitors: $C = \epsilon \cdot \dfrac{A}{d}$ $\quad Q = C \cdot v$ $\quad w_C = \dfrac{1}{2} C v^2$

Inductors: $L = \mu \cdot \dfrac{N^2 A}{l}$ $\quad B \sim i$ $\quad w_L = \dfrac{1}{2} L i^2$

AC power: $p(t) = \dfrac{1}{2} V_m I_m \cdot \cos(\theta_v - \theta_i) + \dfrac{1}{2} V_m I_m \cdot \cos(2\omega t + \theta_v + \theta_i)$

$P = \dfrac{1}{2} V_m I_m \cos(\theta_v - \theta_i)$ $\quad Q = \dfrac{1}{2} V_m I_m \sin(\theta_v - \theta_i)$ $\quad X_{rms} = \sqrt{\dfrac{1}{T} \int_0^T x(t)^2 dt}$

Trigonometry:

$\sin(-\alpha) = -\sin(\alpha)$ $\quad \cos(-\alpha) = \cos(\alpha)$

$\sin(\pi - \alpha) = \sin(\alpha)$ $\quad \cos(\pi - \alpha) = -\cos(\alpha)$

$\sin\left(\dfrac{\pi}{2} - \alpha\right) = \cos(\alpha)$ $\quad \cos\left(\dfrac{\pi}{2} - \alpha\right) = \sin(\alpha)$

$\sin\left(\alpha - \dfrac{\pi}{2}\right) = -\cos(\alpha)$ $\quad \cos\left(\alpha - \dfrac{\pi}{2}\right) = \sin(\alpha)$

$\sin(2\alpha) = 2\sin(\alpha)\cos(\alpha)$ $\quad \cos(2\alpha) = \cos^2(\alpha) - \sin^2(\alpha)$

$\sin(\alpha \pm \beta) = \sin(\alpha)\cos(\beta) \pm \cos(\alpha)\sin(\beta)$

$\cos(\alpha \pm \beta) = \cos(\alpha)\cos(\beta) \mp \sin(\alpha)\sin(\beta)$

$\sin(\alpha)\sin(\beta) = 0.5 \cdot (\cos(\alpha - \beta) - \cos(\alpha + \beta))$

$\cos(\alpha)\cos(\beta) = 0.5 \cdot (\cos(\alpha - \beta) + \cos(\alpha + \beta))$

$\sin(\alpha)\cos(\beta) = 0.5 \cdot (\sin(\alpha - \beta) + \sin(\alpha + \beta))$

α:	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin(\alpha)$:	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\tan(\alpha)$:	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	∞