ECE 35, Fall 2022

Your sequence number [ ]

Last name [ ]

First + middle name(s) [ ]

**PID** [ ]

Quiz 1

[ ] / 12

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. Make sure you list units!
- Answers without supporting calculations will receive zero credit

(1) (a) What is the power P received by the voltage source? *(1 point)*

P [ ]

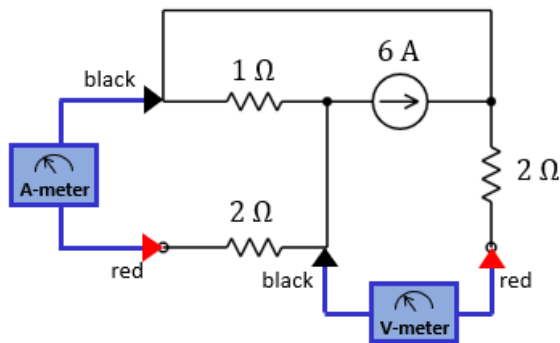(b) What is current i_a? *(1 point)*

i_a [ ]
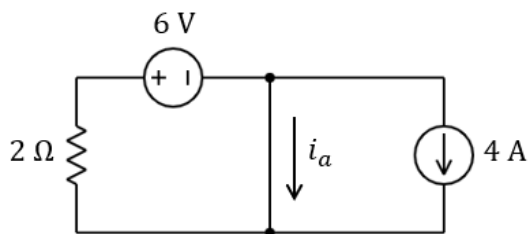
(2) In the problem below, the voltmeter and ammeter are ideal.

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

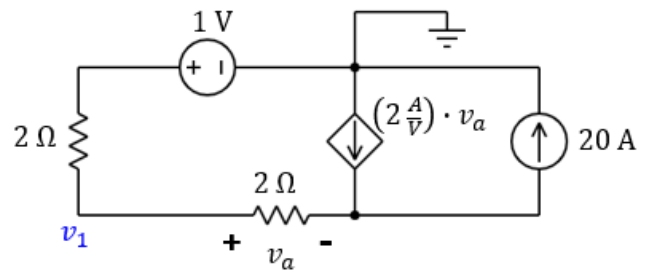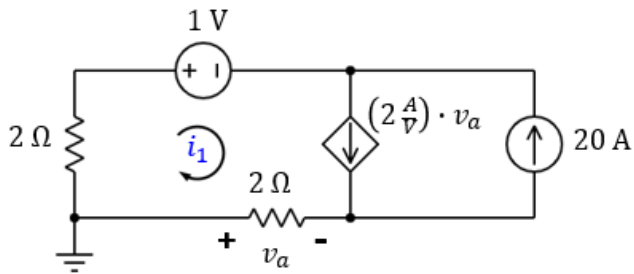(b) What is the reading *Y* of the ammeter? *(2 points)*

X

Y

(3) (a) Find the mesh current i_1 in the circuit on the left. You can use any analysis method. *(4 points)*

i_1 [ ]

(b) Find the node voltage v_1 in the circuit on the right. Note that this is the same circuit as the one on the left, just with the ground moved to a new location. *(2 points)*

v_1 [ ]

1 V
+ I

$2\,\Omega$

i_1

$2\,\Omega$

$\left(2\tfrac{A}{V}\right) \cdot v_a$

↑ 20 A

+ v_a −

1 V
+ I

$2\,\Omega$

$2\,\Omega$

v_1

$\left(2\tfrac{A}{V}\right) \cdot v_a$

↑ 20 A

+ v_a −

ECE35 Equation Sheet

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

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

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

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

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

Trigonometry:

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

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

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

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

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

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

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

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

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

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

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