

Allowed Materials: F.E. approved calculator(s) see syllabus; pencils and/or pens.

ExamForm := 14

Honor Statement: On my honor, I promise that I have not received any unauthorized assistance on this exam (I didn't look at another student's paper, I didn't view any unauthorized written materials, I didn't talk or listen to another student, I didn't use an unauthorized calculator, I didn't use any electronic device, any visual or auditory signals, or any other techniques of exchanging information with others.) I have maintained the highest standards of academic integrity while completing this exam.

Signed: _____

Instructions: Encode your answer to each question by darkening the appropriate circle on your response form. You are also encouraged to work neatly and circle your chosen answers on the exam document so that you are better able to review your work if you find the need. However, the answers you encode on the response form will be taken as your definitive answers, and the entire basis for your grade. Please review your response form carefully before submission.

1. (2 point deduction for failure to complete this problem!)

- Write in all of the indicated information in the boxes of your response form.
- Darken the appropriate circles to encode the corresponding information.
- Write your name on this exam and sign the Honor Statement.

Notes:

- If your last name is too long, just write the first 10 letters.
- "F.I." and "M.I." are your first and middle initials, respectively
- Your "Username" is the first part of your LATech email address
- For "Section" use the guide provided to the right
- Your "Exam Form" is printed on the upper right corner of this page.
- Indicate "ENGR" as the "Program"

Exam Form	Program
<input type="radio"/>	BIEN
<input type="radio"/>	CMEN
<input type="radio"/>	CVEN
<input type="radio"/>	CVTE
<input type="radio"/>	CYEN
<input type="radio"/>	FLFN

Bubble:	For Course Section:
91	H01 Cronk TR 2-3:50
92	H02 SwanbomTR 8-9:50
93	H03 Harbour MW 2-3:50
94	H04 Cronk MW 4-5:50
95	H05 Reeves TR 10-11:50
96	H06 Easley MW 10-11:50
97	H07 Hall MW 12-1:50
98	H08 Scoggin MW 8-9:50
01	001 Decuir MW 10-11:50
02	002 Orr MW 2-3:50
03	003 Scoggin TR 2-3:50
04	004 Dressel MW 8-9:50
05	005 Reeves TR 4-5:50
06	006 Reis TR 12-1:50
07	007 Harbour MW 12-1:50
08	008 Reis MW 4-5:50
09	009 Scoggin TR 12-1:50
10	010 Scoggin TR 8-9:50

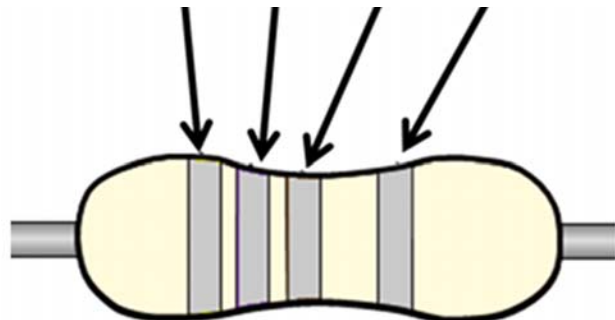
Last Name	F.I.	M.I.	LA Tech Username	Course #	Section (last 2 digits)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Choices = ("A" "I properly completed all required items in problem 1, so I will not lose these points")
("B" "I did not properly complete problem 1 because I am fine with losing these points.")

2. (3 points) Given the color pattern indicated, which value could be the actual resistance of the resistor shown?

- Choices =
- "A" 37
 - "B" 307
 - "C" 31200000
 - "D" 27000000
 - "E" 730
 - "F" 73
 - "G" 30000000
 - "H" 33000000
- Ω

color_pattern = ("black" "orange" "violet" "gold")





3. (3 points) You take several different sizes of standard alkaline batteries and connect them all in series (with the head of each one touching the tail of the next). If the number of each size cell in your set is listed below, what will be the total voltage?

$$D_{\text{cells}} = 2 \quad AA_{\text{cells}} = 3 \quad AAA_{\text{cells}} = 3$$

Choices = $\left(\begin{array}{l} \text{"A"} \quad 10.5 \\ \text{"B"} \quad 15.0 \\ \text{"C"} \quad 16.5 \\ \text{"D"} \quad 12.0 \\ \text{"E"} \quad 13.5 \\ \text{"F"} \quad 0.0 \\ \text{"G"} \quad 1.5 \\ \text{"H"} \quad 9.0 \end{array} \right) \cdot V$

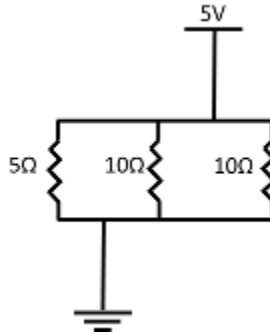


4. (3 points) The tool in SolidWorks used to create a rounded internal or external face along one or more edges is:

Choices = $\left(\begin{array}{l} \text{"A"} \quad \text{"revolve"} \\ \text{"B"} \quad \text{"revolved cut"} \\ \text{"C"} \quad \text{"extrude"} \\ \text{"D"} \quad \text{"fillet"} \\ \text{"E"} \quad \text{"linear pattern"} \\ \text{"F"} \quad \text{"rib"} \\ \text{"G"} \quad \text{"mirror"} \\ \text{"H"} \quad \text{"swept cut"} \end{array} \right)$



5. (3 points) What is the potential difference across the 5Ω resistor?



Choices = $\left(\begin{array}{l} \text{"A"} \quad \text{"2.0 Volts"} \\ \text{"B"} \quad \text{"0.75 Volts"} \\ \text{"C"} \quad \text{"0.0 Volts"} \\ \text{"D"} \quad \text{"10.0 Volts"} \\ \text{"E"} \quad \text{"5.0 Volts"} \\ \text{"F"} \quad \text{"5.0 Amps"} \\ \text{"G"} \quad \text{"1.3 Volts"} \\ \text{"H"} \quad \text{"1.0 Amps"} \end{array} \right)$

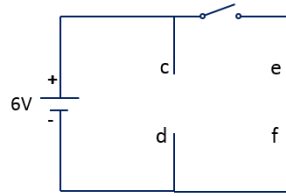


6. (3 points) Which command is used in the Arduino IDE to establish a pin as either an input or an output?

Choices = $\left(\begin{array}{l} \text{"A"} \quad \text{"void setup"} \\ \text{"B"} \quad \text{"digitalWrite"} \\ \text{"C"} \quad \text{"pinMode"} \\ \text{"D"} \quad \text{"for"} \\ \text{"E"} \quad \text{"void loop"} \\ \text{"F"} \quad \text{"if"} \\ \text{"G"} \quad \text{"digitalwrite"} \\ \text{"H"} \quad \text{"delay"} \end{array} \right)$



7. (3 points) Given the below circuit diagram, identify the location and direction that LED shown can be connected such that it immediately illuminates.



Choices =

- | | |
|-----|-------------------------------|
| "A" | "a to e & b to f" |
| "B" | "a to c & b to d" |
| "C" | "b to c & a to d" |
| "D" | "a to f & b to e" |
| "E" | "a to c & b to e" |
| "F" | "Both answer choices A and B" |
| "G" | "Both answer choices C and D" |
| "H" | "No combination works" |



8. (3 points) How many holes should you have punched into your Aluminum plate that you used to construct your robot?

Choices =

- | | |
|-----|----|
| "A" | 4 |
| "B" | 11 |
| "C" | 0 |
| "D" | 9 |
| "E" | 8 |
| "F" | 7 |
| "G" | 3 |
| "H" | 6 |



9. (3 points) Which Arduino command, if used repeatedly, will continue to print all data (x) on a single row of your serial monitor?

Choices =

- | | |
|-----|---------------------|
| "A" | "Serial.print(x)" |
| "B" | "pinMode(x,OUTPUT)" |
| "C" | "digitalWrite(x)" |
| "D" | "Serial.println(x)" |
| "E" | "digitalRead(x)" |
| "F" | "Serial.begin(x)" |
| "G" | "void setup(x)" |
| "H" | "pinmode(x,OUTPUT)" |



10. (3 points) This is the measure of electric potential in a circuit:

Choices =

- | | |
|-----|--------------|
| "A" | "Joules" |
| "B" | "Amperes" |
| "C" | "Work" |
| "D" | "Voltage" |
| "E" | "Resistance" |
| "F" | "Coulombs" |
| "G" | "Power" |
| "H" | "Current" |



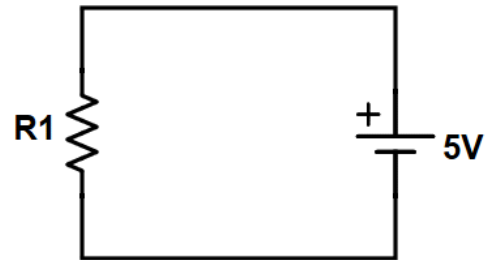
11. (3 points) In a circuit with a single battery (V_1) and a single resistor (R_1), what is the current flowing through the circuit?

Choices = $\left(\begin{array}{l} \text{"A"} \quad "V_1 \cdot V_1" \\ \text{"B"} \quad "V_1 / R_1" \\ \text{"C"} \quad "R_1 \cdot R_1" \\ \text{"D"} \quad "R_1 / V_1" \\ \text{"E"} \quad "R_1 \cdot V_1" \\ \text{"F"} \quad "(V_1 \cdot V_1) / R_1" \\ \text{"G"} \quad "V_1" \\ \text{"H"} \quad "V_1 \cdot R_1" \end{array} \right)$



12. (5 points) If the current shown leaves the power source, then the resistance of R_1 is closest to:

Choices = $\left(\begin{array}{l} \text{"A"} \quad 86.95 \\ \text{"B"} \quad 94.60 \\ \text{"C"} \quad 102.16 \\ \text{"D"} \quad 109.75 \\ \text{"E"} \quad 117.40 \\ \text{"F"} \quad 125.00 \\ \text{"G"} \quad 132.59 \\ \text{"H"} \quad 140.18 \end{array} \right) \Omega$



$$I = 40 \cdot \text{mA}$$



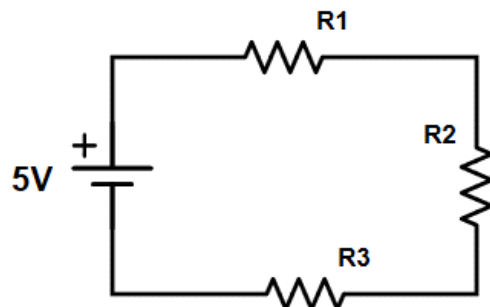
13. (5 points) The power consumed by resistor R_2 is closest to:

Choices = $\left(\begin{array}{l} \text{"A"} \quad 4.00 \\ \text{"B"} \quad 4.32 \\ \text{"C"} \quad 4.65 \\ \text{"D"} \quad 4.97 \\ \text{"E"} \quad 5.29 \\ \text{"F"} \quad 5.61 \\ \text{"G"} \quad 5.93 \\ \text{"H"} \quad 6.25 \end{array} \right) \cdot \text{mW}$

$$R_1 = 470 \Omega$$

$$R_2 = 220 \Omega$$

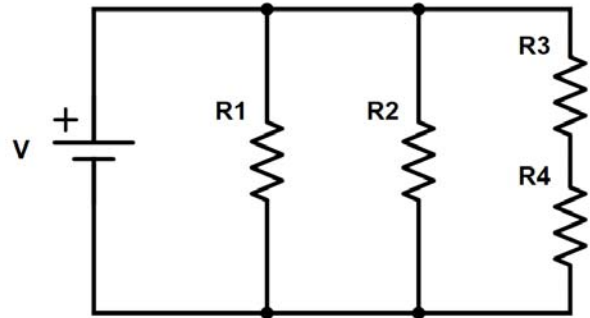
$$R_3 = 330 \Omega$$





14. (5 points) For the circuit shown, the current through resistor R1 is closest to:

- Choices =
- | | | |
|-----|-------|-----|
| "A" | 9.48 | .mA |
| "B" | 10.33 | |
| "C" | 11.14 | |
| "D" | 11.97 | |
| "E" | 12.81 | |
| "F" | 13.64 | |
| "G" | 14.46 | |
| "H" | 15.29 | |



$$R1 = 660 \, \Omega \quad R2 = 660 \, \Omega$$

$$R3 = 330 \, \Omega \quad R4 = 330 \, \Omega$$

$$V = 9 \, \text{V}$$



15. (5 points) Suppose you have a flashlight whose bulb has a known resistance of $R = 13 \, \Omega$. In order to power the flashlight, you connect a number of 1.5V AA batteries (number given below) in series, with the head of each touching the tail of the next. If you leave the flashlight on for a total time = 5·minutes, how many electrons leave the negative terminal of the battery?

- Choices =
- | | | |
|-----|------------------------|------------|
| "A" | 4.058×10^{20} | .electrons |
| "B" | 4.32×10^{20} | |
| "C" | 4.583×10^{20} | |
| "D" | 4.846×10^{20} | |
| "E" | 5.107×10^{20} | |
| "F" | 5.368×10^{20} | |
| "G" | 5.633×10^{20} | |
| "H" | 5.893×10^{20} | |
- number = 2·batteries



16. (5 points) A student would like to use Excel to calculate the volumes of cylinders with different heights and radii. To save time, the student wants to be able to type the formula for calculating the volume of a cylinder one time in cell C4 and then drag the cell so that the other cells will have the same formula but only use their respective heights and radii. The formula the student should type into cell C4 is ...

The equation to calculate the volume of a cylinder is:

$$V = \pi \cdot r^2 \cdot h$$

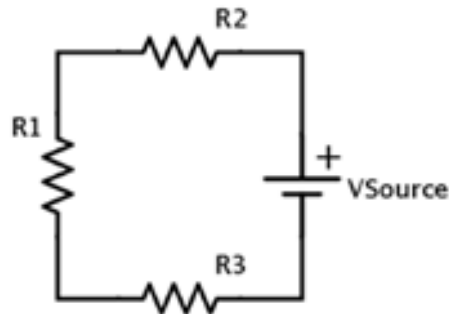
C4		✕ ✓ <i>fx</i>				
	A	B	C	D	E	F
1			$\pi =$	3.14159		
2			radius (cm)			
3			1	2	3	4
4	height (cm)	2				
5		4				
6		6				
7		8				

- Choices =
- "A" "=\$D\$1*\$C\$3*\$B\$4"
 - "B" "=\$D\$1*\$C\$3^2*\$B\$4"
 - "C" "=\$D1*\$C3^2*\$B4"
 - "D" "=\$D\$1*\$C\$3^2*\$B\$4"
 - "E" "=\$D\$1*\$C3^2*\$B\$4"
 - "F" "=\$D1*\$C3^2*\$B4"
 - "G" "=\$D\$1*\$C\$3^2*\$B\$4"
 - "H" "=\$D\$1*\$C\$3^2*\$B\$4"



17. (5 points) The power dissipated by R3 is closest to:

- Choices =
- "A" 0.025
 - "B" 0.080
 - "C" 0.012
 - "D" 0.750
 - "E" 0.300
 - "F" 0.250
 - "G" 1.000
 - "H" 3.000
- .W



$$V_{\text{Source}} = 5 \text{ V}$$

$$R_1 = 300 \, \Omega$$

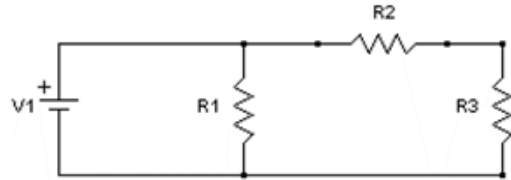
$$R_2 = 100 \, \Omega$$

$$R_3 = 150 \, \Omega$$



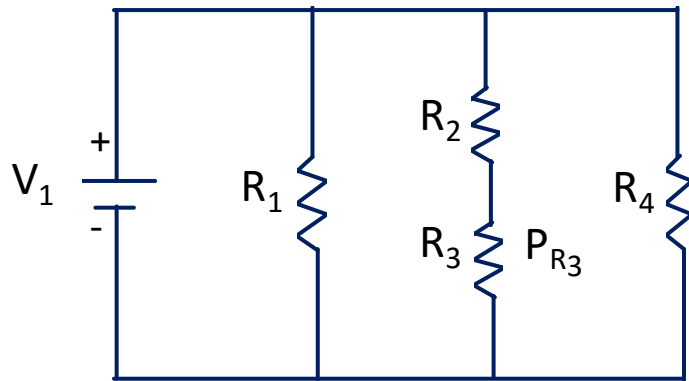
18. (5 points) For the circuit below (where $V_1 = 5\text{V}$, $R_1 = 1000\Omega$, $R_2 = 470\Omega$, $R_3 = 220\Omega$), the voltage drop across R_3 is closest to:

- Choices = $\left(\begin{array}{l} \text{"A"} \quad 1.6 \\ \text{"B"} \quad 2.4 \\ \text{"C"} \quad 3.9 \\ \text{"D"} \quad 4.1 \\ \text{"E"} \quad 5.0 \\ \text{"F"} \quad 6.2 \\ \text{"G"} \quad 2.7 \\ \text{"H"} \quad 1.9 \end{array} \right) \cdot \text{V}$



19. (5 points) The power dissipated by R_3 is $P_{R_3} = 200\text{ W}$. With the given resistor values, what is the current flowing through R_3 ?

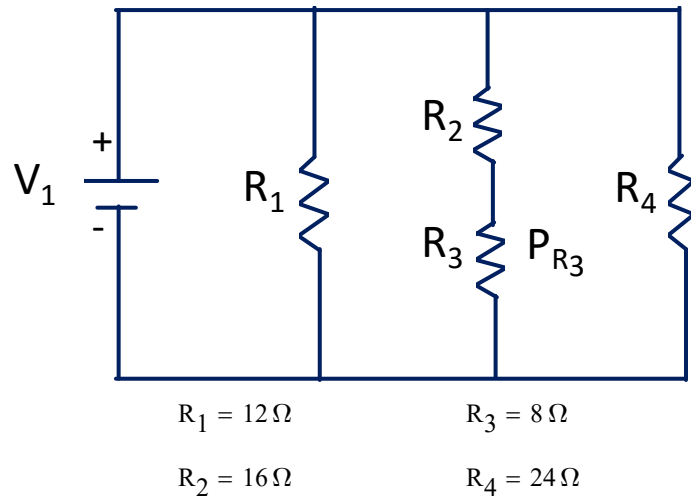
- Choices = $\left(\begin{array}{l} \text{"A"} \quad 4.6 \\ \text{"B"} \quad 5.0 \\ \text{"C"} \quad 5.4 \\ \text{"D"} \quad 5.7 \\ \text{"E"} \quad 6.1 \\ \text{"F"} \quad 6.4 \\ \text{"G"} \quad 6.8 \\ \text{"H"} \quad 7.1 \end{array} \right) \cdot \text{A}$



$$R_1 = 12\Omega \quad R_2 = 16\Omega \quad R_3 = 8\Omega \quad R_4 = 24\Omega$$

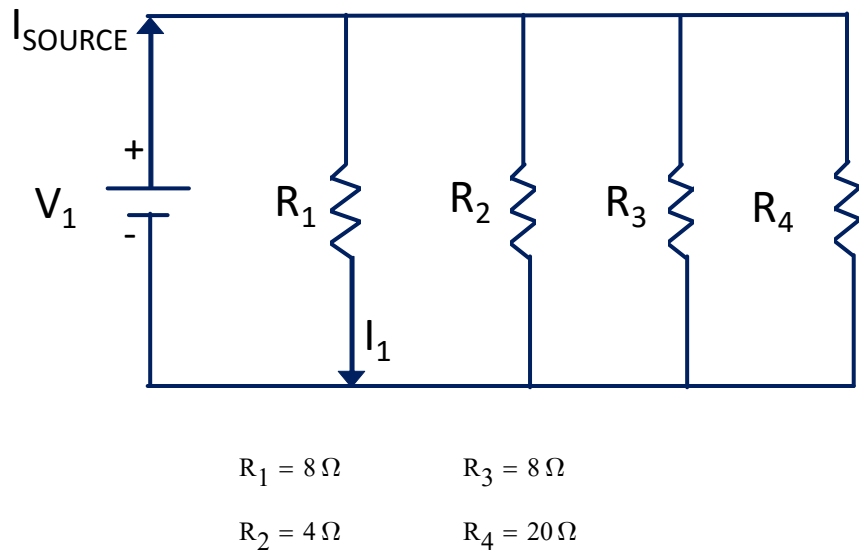
20. (5 points) The power dissipated by R_3 is $P_{R3} = 200 \text{ W}$. With the given resistor values, what is the value of the voltage source V_1 ?

Choices = $\left(\begin{array}{l} \text{"A"} \quad 68.9 \\ \text{"B"} \quad 77.7 \\ \text{"C"} \quad 86.1 \\ \text{"D"} \quad 94.6 \\ \text{"E"} \quad 103.0 \\ \text{"F"} \quad 111.5 \\ \text{"G"} \quad 120.0 \\ \text{"H"} \quad 128.5 \end{array} \right) \text{ V}$



21. (5 points) The current flowing through R_1 is $I_1 = 2 \text{ A}$. With the given resistor values, what is the current leaving the source?

Choices = $\left(\begin{array}{l} \text{"A"} \quad 5.60 \\ \text{"B"} \quad 6.13 \\ \text{"C"} \quad 6.66 \\ \text{"D"} \quad 7.20 \\ \text{"E"} \quad 7.73 \\ \text{"F"} \quad 8.26 \\ \text{"G"} \quad 8.80 \\ \text{"H"} \quad 9.33 \end{array} \right) \text{ A}$





22. (5 points) The equivalent resistance of the resistor network shown is closest to:

- Choices = $\left(\begin{array}{l} \text{"A"} \ 33 \\ \text{"B"} \ 36 \\ \text{"C"} \ 38 \\ \text{"D"} \ 41 \\ \text{"E"} \ 44 \\ \text{"F"} \ 47 \\ \text{"G"} \ 50 \\ \text{"H"} \ 53 \end{array} \right) \Omega$

$$R_1 = 17 \Omega$$

$$R_2 = 12 \Omega$$

$$R_3 = 24 \Omega$$

$$R_4 = 2 \Omega$$

$$R_5 = 10 \Omega$$

$$R_6 = 20 \Omega$$

$$R_7 = 20 \Omega$$

$$R_8 = 60 \Omega$$

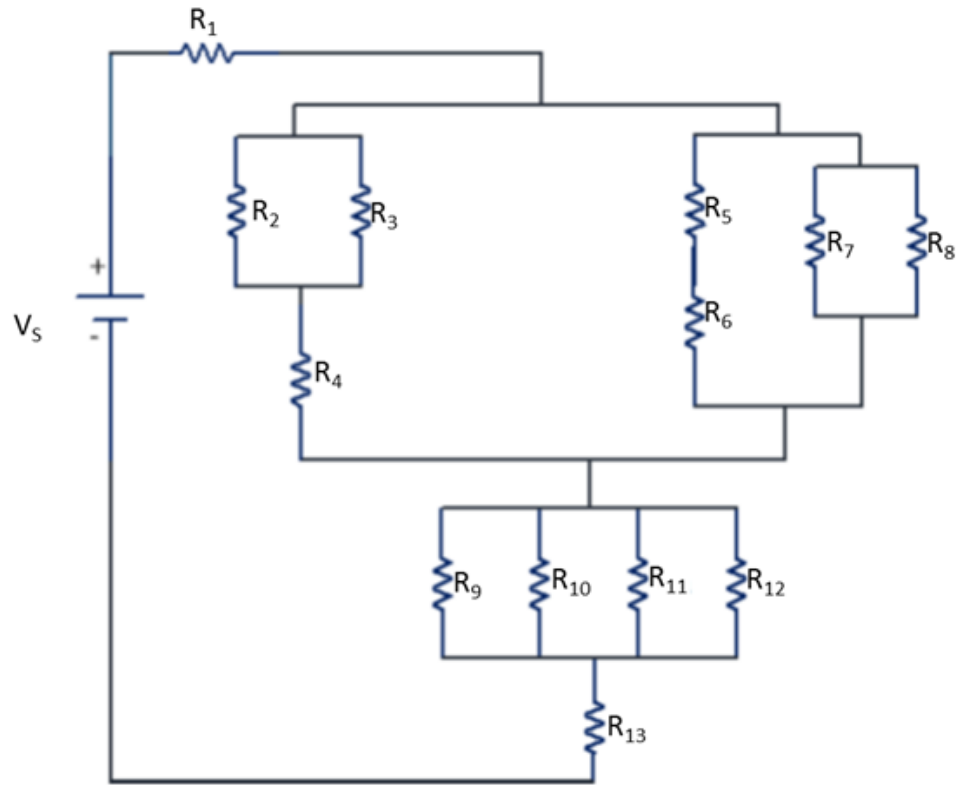
$$R_9 = 20 \Omega$$

$$R_{10} = 80 \Omega$$

$$R_{11} = 24 \Omega$$

$$R_{12} = 48 \Omega$$

$$R_{13} = 17 \Omega$$



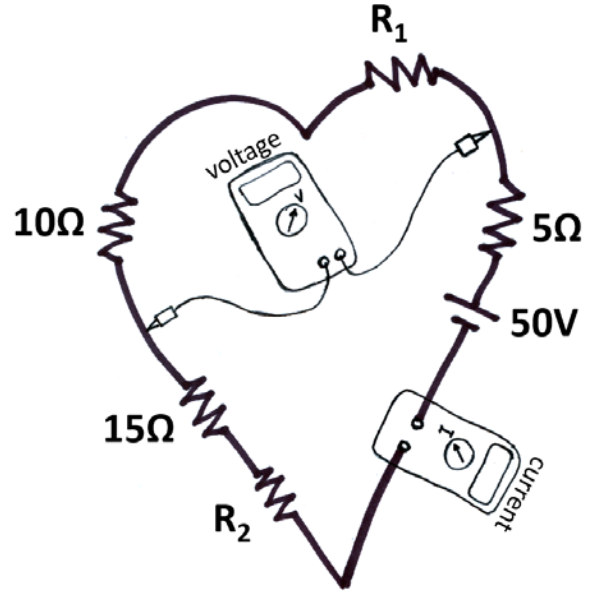


23. (5 points) Two multimeters are used to evaluate a circuit, where one measures current and the other measures voltage (as indicated). The values of the measured voltage and current are provided below.

The value of the resistance of R2 is closest to . . .

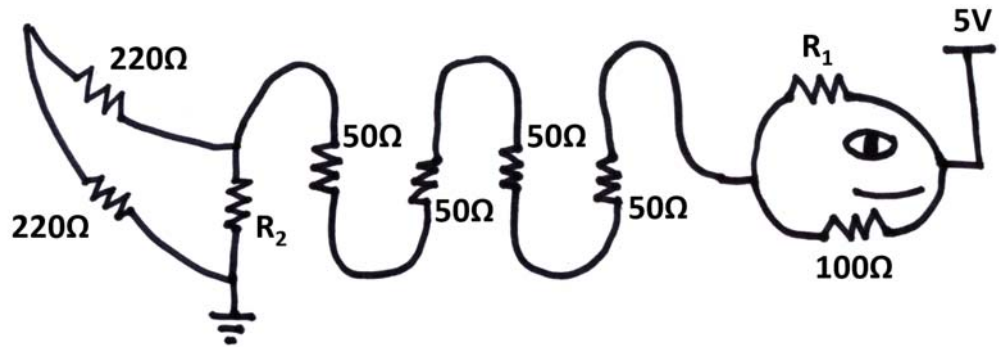
- Choices =
- | | |
|-----|-----|
| "A" | 4.0 |
| "B" | 4.2 |
| "C" | 4.5 |
| "D" | 4.7 |
| "E" | 4.9 |
| "F" | 5.2 |
| "G" | 5.4 |
| "H" | 5.7 |
- Ω

$V_m = 25.3 \text{ V}$
 $I_m = 1 \text{ A}$



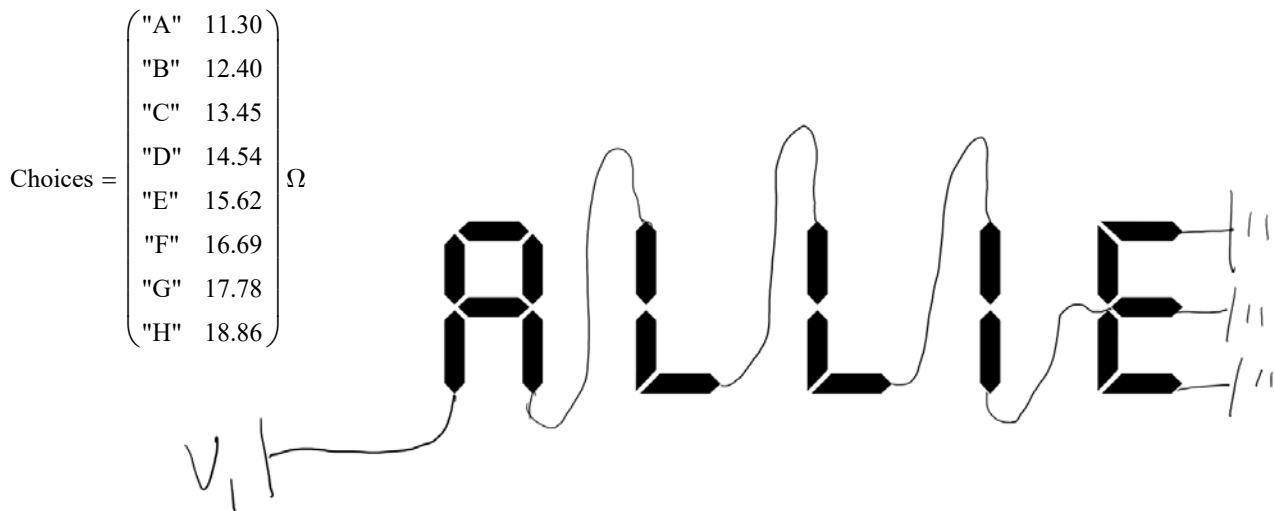
24. (5 points) If $R_1 = 100 \cdot \Omega$ and $R_2 = 470 \cdot \Omega$, then the current flowing through the circuit is closest to ...

- Choices =
- | | |
|-----|------|
| "A" | 8.9 |
| "B" | 9.4 |
| "C" | 9.9 |
| "D" | 10.5 |
| "E" | 11.0 |
| "F" | 11.5 |
| "G" | 12.1 |
| "H" | 12.6 |
| "I" | 13.1 |
| "J" | 13.7 |
- mA





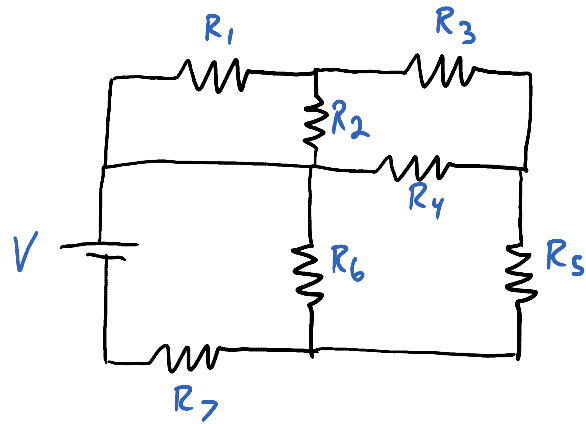
25. (5 points) The engineering professors have decided to open our own alligator farm, and have just purchased our first alligator. We want to highlight her name ("Allie", of course) on our new sign. We have purchased a power source capable of providing $V_1 = 400\text{ V}$ and $I_1 = 2\text{ A}$. The circuit we developed for the sign is shown below. If the lamps we are using to light up the sign can be modelled as simple resistors, and each lamp, which looks like a segment of an LED, has the same value of resistance, then what is the minimum value of resistance we can use for the lamps to get the brightest-looking sign without exceeding the capabilities of the power source? (Note: The "A" has 6 lamps, each of the "L"s have 3 lamps, the "I" has 2 lamps, and the "E" has 5 lamps.)





26. (5 points) Given the circuit diagram and the values listed, find the total power dissipated by the network of resistors. The power is nearest to...

- Choices =
- | | | | |
|-----|-------|---|---|
| "A" | 291.1 | } | W |
| "B" | 312.8 | | |
| "C" | 334.4 | | |
| "D" | 356.0 | | |
| "E" | 377.8 | | |
| "F" | 399.2 | | |
| "G" | 421.0 | | |
| "H" | 442.9 | | |



$$V = 80 \text{ V} \quad R_1 = 90 \Omega$$

$$R_2 = 180 \Omega \quad R_3 = 135 \Omega$$

$$R_4 = 195 \Omega \quad R_5 = 31 \Omega$$

$$R_6 = 12 \Omega \quad R_7 = 7 \Omega$$



ExamForm = 14

1. (2 point deduction for failure to complete this problem!)

- Write in all of the indicated information in the boxes of your response form.
- Darken the appropriate circles to encode the corresponding information.
- Write your name on this exam and sign the Honor Statement.

Notes:

- If your last name is too long, just write the first 10 letters.
- "F.I." and "M.I." are your first and middle initials, respectively
- Your "Username" is the first part of your LATEch email address
- For "Section" use the guide provided to the right
- Your "Exam Form" is printed on the upper right corner of this page.
- Indicate "ENGR" as the "Program"

Exam Form		Program	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	BIEN
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	CMEN
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	CVEN
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	CVTE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	CYEN
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	FIEN

Bubble:	For Course Section:		
91	H01	Cronk	TR 2-3:50
92	H02	Swanbom	TR 8-9:50
93	H03	Harbour	MW 2-3:50
94	H04	Cronk	MW 4-5:50
95	H05	Reeves	TR 10-11:50
96	H06	Easley	MW 10-11:50
97	H07	Hall	MW 12-1:50
98	H08	Scoggin	MW 8-9:50
01	001	Decuir	MW 10-11:50
02	002	Orr	MW 2-3:50
03	003	Scoggin	TR 2-3:50
04	004	Dressel	MW 8-9:50
05	005	Reeves	TR 4-5:50
06	006	Reis	TR 12-1:50
07	007	Harbour	MW 12-1:50
08	008	Reis	MW 4-5:50
09	009	Scoggin	TR 12-1:50
10	010	Scoggin	TR 8-9:50

Last Name	F.I.	M.I.	LA Tech Username	Course #	Section (last 2 digits)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
(A) (A) (A) (A) (A) (A) (A) (A) (A) (A)	(A)	(A)	(A) (A) (A) (0) (0) (0)	(0) (0) (0) (0) (0)	

Choices = ("A" "I properly completed all required items in problem 1, so I will not lose these points")
 ("B" "I did not properly complete problem 1 because I am fine with losing these points.")

Reference Information:

1 coulomb = 6.24(10)¹⁸ electrons
 Avogadro's Number = 6.022(10)²³ per mol
 1 inch = 2.54 cm
 $Cu = 1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

color	digit
black	0
brown	1
red	2
orange	3
yellow	4
green	5
blue	6
violet	7
gray	8
white	9

