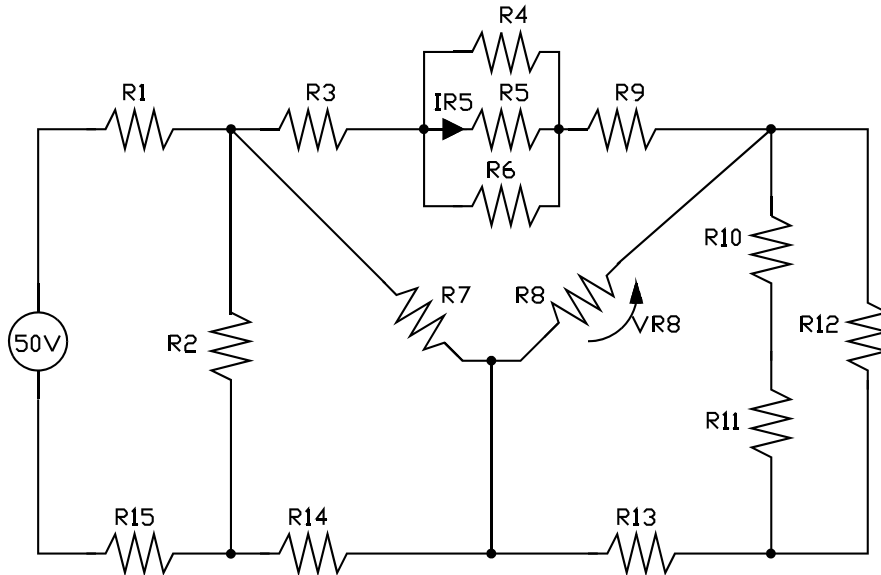


ELTK1100 REVIEW QUESTIONS

1. What is the maximum current that a 10kΩ, 10W resistor can handle? **(31.6 mA)**
2. Three (3) resistors are connected in parallel, one has a resistance of 50Ω, the 2nd dissipates a power of 200W and the 3rd has a voltage drop of 50V. If the total current is 7 amps; calculate the value of the unknown resistors.
(R₂ = 12.5Ω, R₃ = 25Ω)
3. What is the resistance of a piece of nickel wire 100' long, with a diameter of 0.065 inches? **(1.11Ω)**
4. What is the diameter in inches of a 500' length of brass wire, if its resistance is 60Ω? **(0.0187")**

5. (See website for straightened out version)



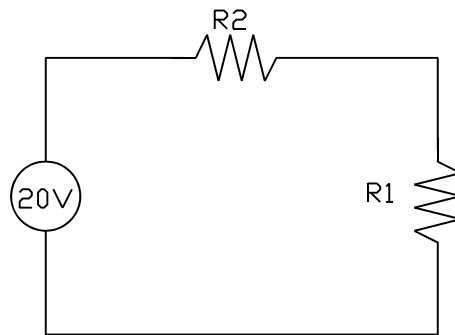
R ₁ = 9Ω	R ₄ = 60Ω	R ₇ = 10Ω	R ₁₀ = 10Ω	R ₁₃ = 14Ω
R ₂ = 30Ω	R ₅ = 40Ω	R ₈ = 24Ω	R ₁₁ = 5Ω	R ₁₄ = 7Ω
R ₃ = 4Ω	R ₆ = 12Ω	R ₉ = 16Ω	R ₁₂ = 30Ω	R ₁₅ = 6Ω

Calculate:

- (a) the total resistance. **(25Ω)**
 - (b) the current through R₅. **(53.3 mA)**
 - (c) the voltage across R₈. **(3.20 V)**
 - (d) the power dissipated by R₁₅. **(24 W)**
6. A copper resistance thermometer has a resistance of 50Ω at 20°C. What is the temperature indicated when the resistance is 30Ω? **(-81.7°C)**

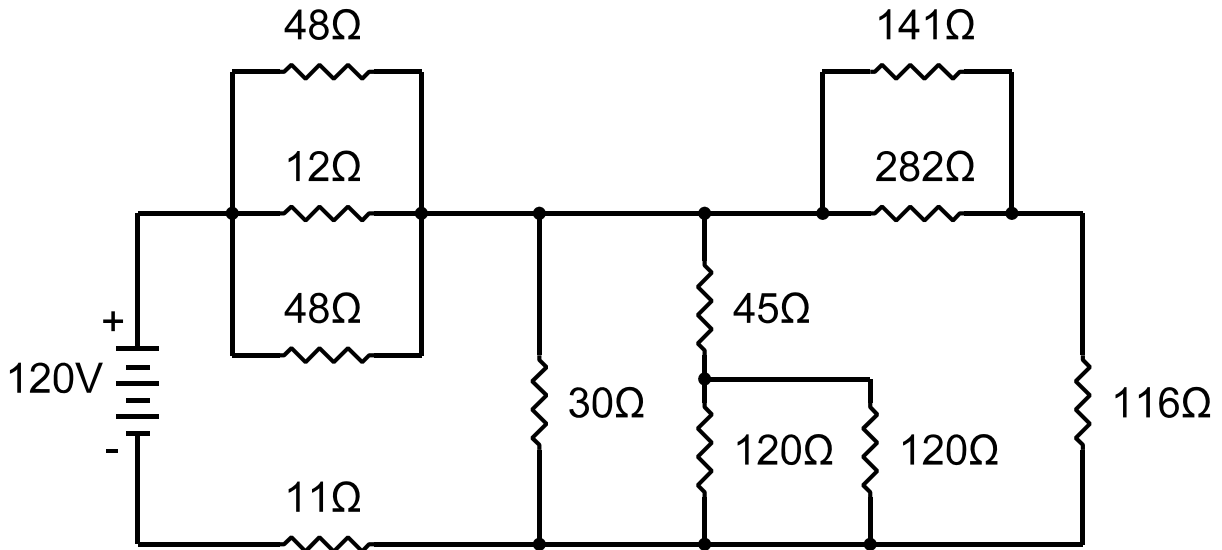
7. A 500V, 10Ω heating element is used to heat 25kg of water. After the heater is in operation for 10 minutes, the temperature of the water is measured to be 80°C. If the heating element is 70% efficient, what was the initial temperature of the water? **(-20.3°C)**
8. Determine the series dropping resistor required to operate a 550W, 120V movie light from a 220V supply. **(21.82Ω, 458.3W)**
9. Design a voltage divider circuit operating from a 300V supply to provide the following loads: 250V at 150mA, 150V at 50mA and 50V at 30mA. Design for a bleeder current of 20mA.
(R_B = 2.5kΩ, 1W R₁ = 2kΩ, 5W R₂ = 1kΩ, 10W R_S = 200Ω, 12.5W)
10. A generator is located 1200' away from its load. The load consists of two, 4 HP motors and twenty, 100W lamps. If the voltage drop in the feeders (copper wire) is not to exceed 5% of the generator voltage, the load voltage is 380 V and the current drawn by the load raises the temperature of the conductor from 20°C to 30°C, calculate:
- required wire size. **(27119CM ⇒ #5, 33,102 CM)**
 - power loss in the feeders. **(actual 330.6W@20°C or 343.6W@30°C) (<419.4W)**
11. Given a 50μA, 200Ω movement, draw the circuit and calculate the resistance required to convert the movement into:
- An ammeter measuring 10mA. **(R_{SH} = 1.005Ω)**
 - A voltmeter measuring 10V. **(R_S = 199.8kΩ)**
 - An ohmmeter using a 3V battery. **(R_{INT} = 59.8kΩ)**
- What external resistance will give a half-scale deflection on the ohmmeter?
(R_{EXT} = 60kΩ)
12. Given a 20μA, 2500Ω movement, draw the circuit and calculate the resistance required to convert the movement into:
- A multirange ammeter measuring: 10mA, 25 mA and 50 mA.
(R_{SH1} = 5.010Ω R_{SH2} = 2.0016Ω R_{SH3} = 1.0004Ω)
 - A multirange voltmeter measuring: 10V, 25V and 50V.
(R_{S1} = 497.5 kΩ R_{S2} = 750 kΩ R_{S3} = 1250 kΩ)
13. Give the coded colours for a 39Ω resistor with a tolerance of 20%. Indicate all bands in your answer. **(ORANGE, WHITE, BLACK, NONE)**
14. Why is copper considered a good conductor? **(One electron in it's valence shell. Far from nucleus. A little energy will cause it to leave atom)**
15. An 80 litre, 220 Volt hot water tank heater has a rated efficiency of 85%. If the tank brings water from 10°C to 80°C in 45 minutes, find:
- the current in the heating elements. **(46.4A)**
 - the cost to heat this water if power is \$0.08/kWh? **(\$0.61)**
- Note: 1 litre of water has a mass of 1 kg.

16. A $100\mu\text{A}$ 200Ω movement is used in a voltmeter to measure the voltage across R_2 in the following circuit. What is the % error caused by the meter insertion? The meter is set on the 20V range. $R_1 = 300\text{ k}\Omega$, $R_2 = 200\text{ k}\Omega$ (37.5%)



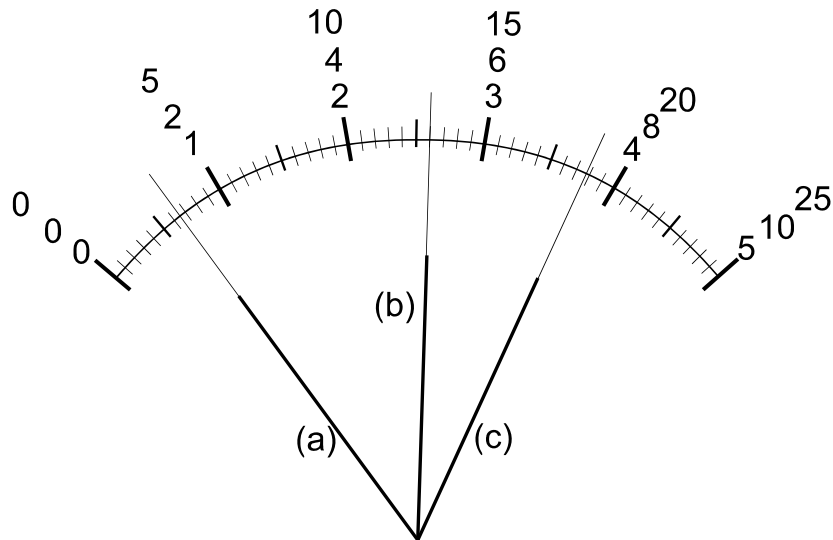
17. An aluminum conductor has a resistance of 0.3Ω at 46°C . What will be the resistance of the conductor at 24°C ? (0.277 Ω)
18. A 600V generator, located 0.5 miles from a plant, provides power to the following loads: six 3 hp cutting machines
If the maximum allowable voltage drop in the feeders is 20%, calculate the minimum wire gage required in the feeder. (12764CM \Rightarrow #9, 13094CM)
Note: 1 mile = 5280 feet and 1 mile = 1.609 km
19. Three (3) resistors are connected in parallel, the 1st has a conductance of 0.002S, the 2nd dissipates a power of 100W and the 3rd has a voltage drop of 100V. If the total current is 6A, calculate the value of the unknown resistances.
($R_1 = 500\Omega$, $R_2 = 100\Omega$, $R_3 = 20.83\Omega$)
20. Design a voltage divider circuit to provide the following loads from a 300V power supply: 250V at 150 mA and 150V at 50 mA
Design for a bleeder current of 50 mA.
($R_B = 3\text{k}\Omega$, 7.5W $R_1 = 1\text{k}\Omega$, 10W $R_S = 200\Omega$, 12.5W)
21. How does reluctance and resistance compare? (Reluctance is the opposition of a magnetic circuit to the production of flux and Resistance is the opposition of an electric circuit to electric current flow. Therefore Reluctance and Resistance provide the opposition in Magnetic Ohm's Law and Ohm's Law, respectively)
22. A solenoid that has 1500 turns of wire is energized by a current of 150mA. The reluctance of the magnetic circuit is $1 \cdot 10^5\text{ A}\cdot\text{T/Wb}$. Calculate the EMF induced in the coil when the current is switched off in 0.02 sec. (169V)
23. Given a $50\mu\text{A}$, $2.5\text{k}\Omega$ meter movement, draw the circuit and calculate the resistances required to convert the movement into a multirange voltmeter having ranges of 10V and 50V. ($R_{S1} = 197.5\text{k}\Omega$, $R_{S2} = 800\text{k}\Omega$)

24. (a) Find the total resistance for the circuit. (**40Ω**)
 (b) Find current in the 45Ω resistor. (**0.6A**)
 (c) Find the power dissipated by the 12Ω resistor. (**48W**)

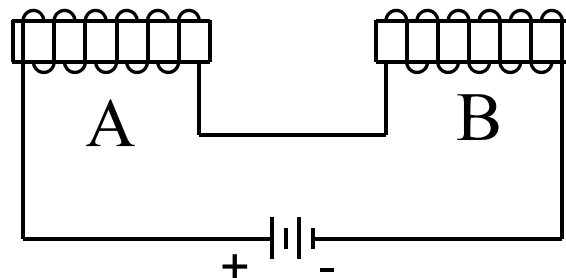


25. Given a 1mA, 100Ω meter movement, draw the circuit and calculate the resistance required to convert the movement into an ohmmeter using a 1.5V battery. (**1.4kΩ**)
26. If 3.0×10^{30} electrons are moved during a static discharge how many Coulombs were involved. (**4.80×10^{11} C**)
27. If 89 Coulombs of charge leave a battery in 16 seconds calculate the average current flow. (**5.56A**)
28. Give the coded colours for a 0.03MΩ resistor with a tolerance of 20%. (**ORANGE, BLACK, ORANGE, NONE**)
29. What does 5% tolerance mean for resistor that is color coded as 1000Ω? (**950Ω-1050Ω**)
30. Resistors used in most meters are made from alloys. Why is this necessary? (**Resistance is constant for temperature changes**)
31. The temperature of 1.25 kg of a liquid with a specific heat of 0.75 is to be raised by 110°C in 30 minutes. The efficiency of heat transfer is 80%. If the source voltage is 110V, determine the power rating of the heating element required. (**300W**)
32. Design a voltage divider circuit to power the following loads from a 200V supply:
 125 V @ 10 mA
 80 V @ 2 W
 Design for a bleeder current of 30mA. Include a drawing of the circuit in your answer. (**$R_B = 2.67k\Omega$, 2.4W $R_1 = 818\Omega$, 2.48W $R_2 = 1.15k\Omega$, 4.88W**)

33. Three meter needles are shown on the following scale. What are the meter measurements if the selector switch is set on the following settings:
 Reading (a) on a setting of 1 on a milliammeter. (**0.13mA**)
 Reading (b) on a setting of 50 on a voltmeter. (**26V**)
 Reading (c) on a setting of 250 on a milliammeter. (**189mA**)

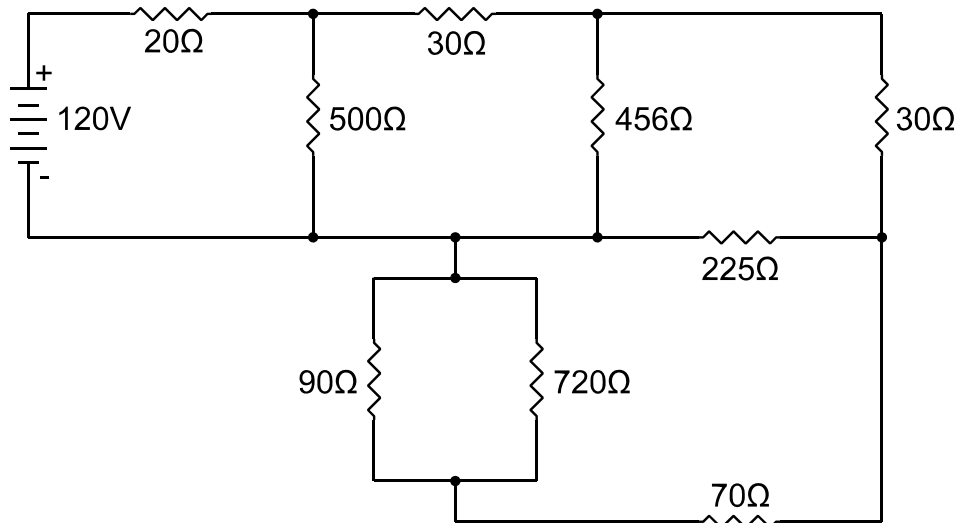


34. Draw the circuit diagram of an ohmmeter. (See notes p.105)
35. Coil A has an inductance of 300 mH and coil B has an inductance of 200 mH.
 (a) Will the two magnets attract or repel each other? Why? (**Repel N-S vs S-N**)
 (b) If a current of 2A is reversed in 0.02 sec, what would be the total induced EMF? (**100V**)
 (c) Repeat (b) with the two coils connected in parallel. (**24V**)

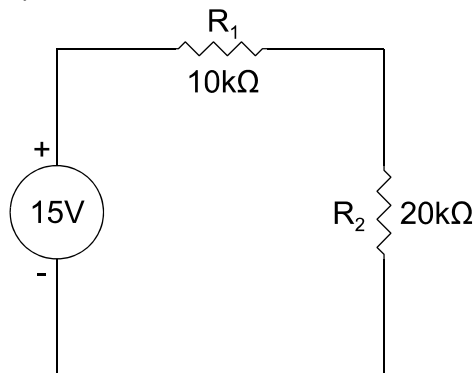


36. A 45cm long conductor made of Brass has a diameter of 0.5mm. What will the resistance be at -20°C ? (**0.1476 Ω**)
37. Three (3) resistors are connected in parallel, the 1st has a conductance of 10mS and the 2nd has a current of 0.5A, dissipating 60W of power. If the total current is 2A, calculate the values of all three resistors.
 (**$R_1 = 100\Omega$, $R_2 = 240\Omega$, $R_3 = 400\Omega$**)
38. List all the factors influencing the strength of an electromagnet. (See notes p.92)

39. (a) Find the total resistance for the circuit. (**120Ω**)
 (b) Find voltage drop across the 456Ω resistor. (**76V**)
 (c) Find the power dissipated by the 500Ω resistor. (**20W**)



40. A load, located 1500 feet from its 500 V source, consists of:
 four - 9 hp, 480V motors.
 one - 25 hp, 480V motor.
- (a) If the feeder contains #3 copper wire, the motor load draws a current of 88.4A. Why will these motors not be able to function properly? Explain, using calculations to back up your answer. (**$V_L = 447.8V$, which is too low**)
- (b) Calculate the correct value of the load current and new wire size, that will allow the motors to perform correctly, based on a load voltage of 480V. (**$I_L = 94.8A$, 147468CM \Rightarrow 3/0 or 000, 167810CM**)
41. (a) Given a 2mA, 200Ω movement, draw the circuit and calculate the resistances required to convert the movement into a multirange voltmeter measuring 10V and 20V. (**$R_{S1} = 4.8kΩ$, $R_{S2} = 5kΩ$**)
- (b) If this voltmeter is set at the 20V range and it is used to measure the voltage across R_1 in the circuit below, determine the % error caused by the meter insertion. (**40%**)



42. The reluctance in a magnetic circuit is 50000 A·T/Wb. How much current is required to produce 0.02 Wb inside a coil having 200 turns? (**5A**)