PHYS 2326 - Dr. Honan - Test 2 - A Name _____

Possibly Useful Information: $k = 9.0\times10^{9}\ N\cdot m^2/kg^2$ $\varepsilon_0 = 8.85\times10^{-12}\ C^2/N\cdot m^2$ $\mu_0 = 4\pi\times10^{-7}\ N/A^2$
$e = 1.60\times10^{-19}C$ $M = 10^6$ $k = 10^3$ $c = 10^{-2}$ $m = 10^{-3}$ $\mu = 10^{-6}$ $n = 10^{-9}$

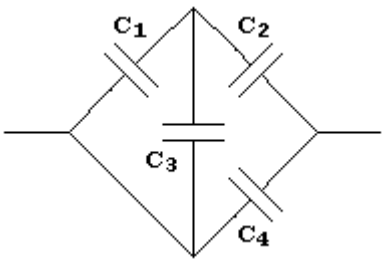
Problem 1 Multiple Choice (4 points each)

_____ [i] What is the direction of the force on a vertical wire with a downward current in the earth's magnetic field? (a) north (b) south (c) east (d) west (e) up (f) down (g) cannot be determined

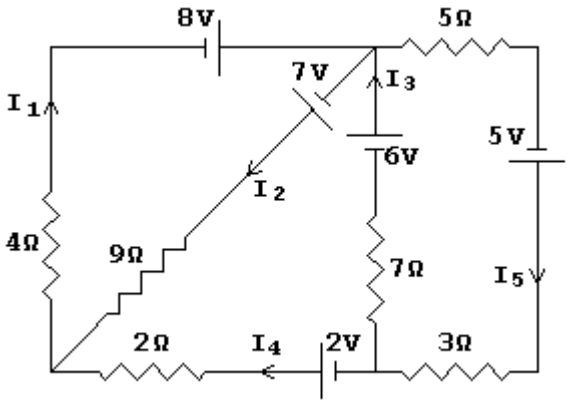
_____ [ii] A particle moves in a counterclockwise (when viewed from above) circle in an upward pointing constant magnetic field. What charge does the particle have?
(a) positive (b) negative (c) zero (d) magnetic charge (e) cannot be determined

_____ [iii] What is the direction of the force on an electron moving upward in a magnetic field to the east? (a) north (b) south (c) east (d) west (e) up (f) down (g) cannot be determined

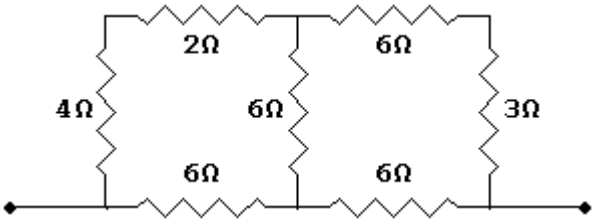
_____ [iv] What is the equivalent capacitance of the combination shown?
(a) $C_1+C_2+C_3+C_4$ (b) $(1/C_1+1/C_2+1/C_3+1/C_4)^{-1}$ (c) $[(C_1+C_3)^{-1}+1/C_2]^{-1}+C_4$
(d) $[(C_1+C_3)^{-1}+(C_2+C_4)^{-1}]^{-1}$ (e) $(1/C_1+1/C_2)^{-1}+(1/C_3+1/C_4)^{-1}$ (f) $(1/C_1+1/C_2)^{-1}+C_3+C_4$ (g) $[(C_1+C_3+C_4)^{-1}+1/C_2]^{-1}$ (h) $\{[(1/C_1+1/C_3)^{-1}+C_2]^{-1}+1/C_4\}^{-1}$ (i) none of the listed



Problem 2 (6 points each)
(a) Give a set of linear equations that can be solved to solve for the currents shown. DO NOT SOLVE



(b) What is the equivalent resistance of the combination shown?



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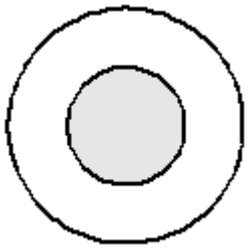
Problem 3 A coaxial cable has an inside wire of radius *a* and an outside conductor of negligible thickness at radius *b*. The region between *a* and *b* is an insulator with dielectric constant κ. If the two conductors are connected across a battery with voltage *V* then what is the energy per length stored in the cable? (6 points)



Problem 4 At 20°C: $\rho_{copper} = 1.7\times10^{-8}\ \Omega\cdot m$ and $\alpha_{copper} = 0.0039/C°$ (6 points each)
(a) A potential difference of 9V is connected across a 50 m length of copper. What is the current density in the wire?

(b) At what temperature will the resistance of a copper wire be 4% less than it is at 20°C?

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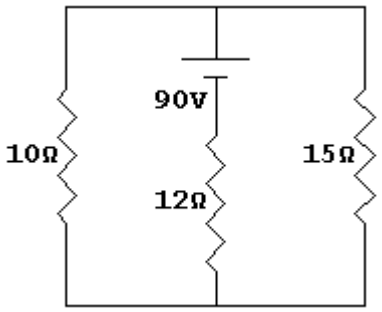
Problem 5 Complete the table with the voltage across and the current through each resistor in the circuit. (7 points)

	10Ω	12Ω	15Ω
V			
I			



Problem 6 What is the force on a 80cm length of wire carrying an 8A current in the y-direction in a magnetic field of $\langle 3, -5, 2 \rangle$ mT (6 points)

Problem 7 A solid conducting sphere with a 2cm radius sits inside a hollow conductor with concentric spherical surfaces with 4cm and 6cm radii. If the two conductors in this configuration are connected across a 12V battery, then what is the magnitude of the charge that flows to each conductor? (6 points)