PHYS 212 Test #4 Spring 2012 Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ohm’s law: v = iR Power: P= vi R in Series = add; R in parallel= R-1=R1-1+ R2-1 +R3-1….

1. In the figure below, an ideal battery of emf = 18 V is connected to a network of resistances *R*1 =7 Ω, *R*2 = 12 Ω, *R*3 = 6 Ω, *R*4 = 4 Ω, and *R*5 = 5 Ω. What is the potential difference (in V) across resistance 1?



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2. In the figure below, the ideal batteries have emfs ε1 = 10V, ε2 = 21V, and ε3 = 5V, and the resistances are each 2.0 Ω.
(a) Determine the current *i1*?
(b) What is the power of battery 1?
(c) Does the battery1 supply or absorb energy?



III. A current-length element *i* produces a differential magnetic field at point *P,* directed *into* the page there. Its value is given by Biot-Savart law as follows: (μ0= 4πx10-7 T.m/A)





1. Show that the magnetic field at *C* due to a circular arc of wire is given by the following equation.





2. In the Figure below, current *i* = 56.2 mA is set up in a loop having two radial lengths and two semicircles of radii *a* = 5.72 cm and *b* = 9.36 cm with a common center *P*. What are the (a) magnitude and (b) direction (into or out of the page) of the magnetic field at *P*



IV. Faraday’s law of induction is given by:

 

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1. In the figure below, the magnetic flux through the loop increases according to the relation *ΦB* = 4.0*t*3 + 3.0*t*2, where *ΦB* is in milliwebers and *t* is in seconds. What is the magnitude of the emf induced in the loop when *t* = 3.0 s? 

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| http://edugen.wiley.com/edugen/courses/crs4957/common/art/pixel.gif |

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V. A 2.0 μC particle moves through a region containing the magnetic field -20 mT and the electric field 350 V/m. At one instant the velocity of the particle is *(*5 - 7 + 9 *)* km/s. At that instant and in unit-vector notation, what is the net electromagnetic force (the sum of the electric and magnetic forces) on the particle?
(Net force on a moving charge in electric and magnetic fields: $\vec{F}=q\vec{E}+q\vec{v}×\vec{B}$)