Exam 3

P202 Spring 2008,
Instructor: Prof. Abanov

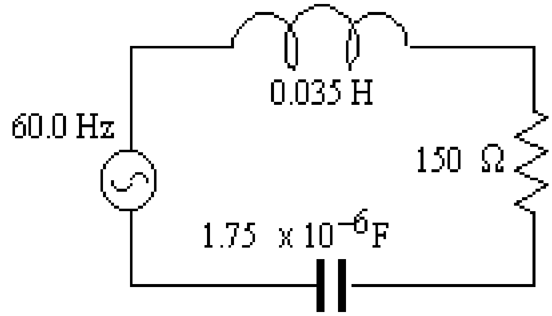
03/27/07

Name______________ Section____________
(print)

Your grade:

Problem 1.

The series RCL circuit is given on the figure.
The source supplies alternating voltage with amplitude 2V .



What is the current in the circuit?______

What is the phase angle between the current and the voltage?______

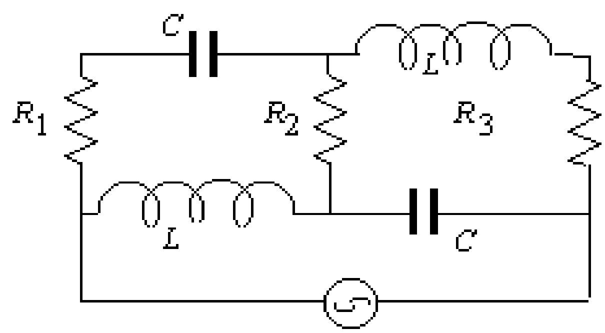
What is the voltage drop on the Inductor?_______

What is the the voltage drop on the capacitor?______

What is the voltage drop on the resistor?_______

What is the resonance frequency of the circuit?_________

Problem 2.



In the circuit shown in the drawing, the generator supplies the same amount of rms voltage $V_{rms} = 2\text{V}$ at either very small or very large frequencies.
The resistance of the resistors are $R_1 = 5\text{k}\,\Omega$, $R_2 = 3\text{k}\,\Omega$, $R_3 = 1\text{k}\,\Omega$.

What is the current trough the capacitors at very small frequency?________

What current is supplied by the source at very small frequency?________

What is the current trough the inductors at very large frequency?________

What current is supplied by the source at very large frequency?________

Problem 3.

A radio station broadcasts at a frequency 830kHz . At some point the magnetic field amplitude of the electromagnetic wave is $4.82\text{x}10^{-11}T$.

What is the wavelength of the electromagnetic wave?________

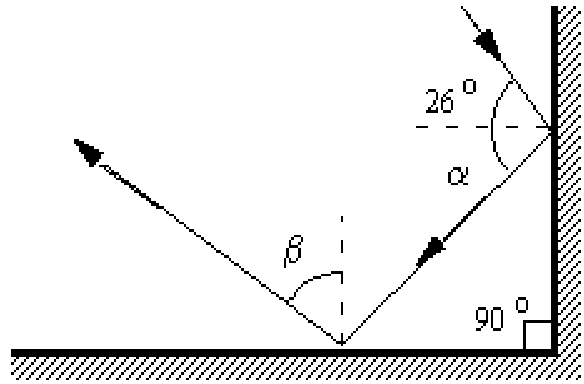
What is the angular frequency of the electromagnetic wave?___________

What is the electric field magnitude of the electromagnetic wave?______

What is the energy density of the electromagnetic wave at this point?_________

Problem 4.

A ray of light is reflected from two plane mirror surfaces as shown in the figure.

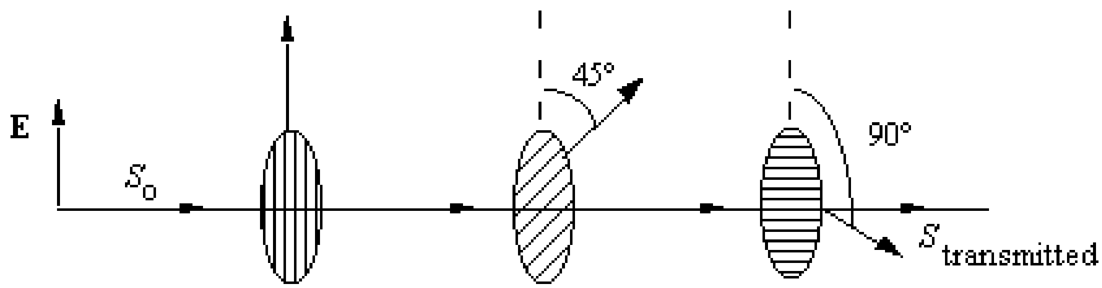


What is angle α ?__________

What is the angle β?________

Problem 5.

An unpolarized beam of light is incident upon a group of three polarizing sheets which are arranged so that the transmission axis of each sheet is rotated by 45° with respect to the preceding sheet as shown.



What fraction of the incident intensity passes through the first polarizer?_________

What fraction of the incident intensity passes through the second polarizer?_________

What fraction of the incident intensity is transmitted? ____________

Problem 6.

An object is placed 30.0 cm from a concave spherical mirror with radius of curvature 40.0 cm.

Is the image virtual or real?___________

Is the image inverted?_____________

What is the focal length of the mirror?____________

What is the distance from the image to the mirror?___________

What is the magnification?_________

Problem 7.

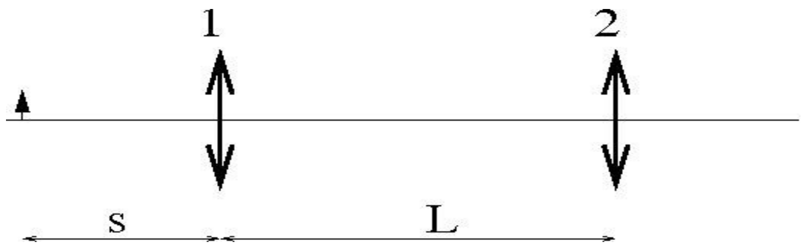
A diver is 2m under water ($n = 1.33$) in a sunny day.

What is the angle of internal reflection?________

What is the radius of the bright spot he will see if he looks up?________

Problem 8.

The object is s=30cm from the first lens. The distance between lenses is L=50cm. The focal length of the first lens is $f_1 = 10\text{cm}$ and of the second lens it is $f_2 = 20\text{cm}$.



What is the distance between the first lens and the first image?________

What is the distance between the second lens and the final image?______

What is the magnification of the first length?_________

What is the magnification of the second lens?_________

What is the final magnification?__________

Is the final image virtual?________

Is the final image inverted?__________

Problem 9.

A telescope with the angular magnification 100 has an objective lens with focal length 50cm.

What is the focal length of the eyepiece?_________

What is the the distance between objective lens and the eyepiece?_______

Problem 10.

A far sighted person has a near point at 80cm.

Does he need convergent or divergent lenses for his glasses?_______

What should be the focal length of his glasses?________

What is the power of that lenses?__________