M.Sc. DEGREE (FIVE YEAR INTEGRATED) I SEMESTER EXAMINATION
IN PHOTONICS
DECEMBER 2003

CEL 1102 ELECTRICITY AND MAGNETISM

Time: 3 Hours Maximum Marks: 50

PART - A

(Answer ***ANY FIVE*** questions)
(Each question carries ***TWO*** marks)

(5 x 2 = 10)

I. (i) Define Electric displacement. Deduce the dimension of Electric displacement.

(ii) What will happen to the energy of a Capacitor when a slab of thickness h and permeability ε which fills the entire space between the plate is introduced into it?

(iii) Distinguish between Dia and Para magnetism.

(iv) Explain Faradays Law of Electromagnetic Induction and explain.

(v) Write the vector notation of force on a charge moving through a region in which both electric and magnetic fields are present. What is Lorentz field?

(vi) What is meant by quality factor of a circuit? What type of LCR circuit is commonly used in a radio with the aerial?

(vii) What will happen if a cyclotron tuned for proton is retuned for He nuclei? Prove your answer.

(viii) Which form of dynamo is useful for charging accumulator and why?

PART - B

(Answer ***ALL*** questions)
(Each question carries ***EIGHT*** marks)

(5 x 8 = 40)

II. (a) Write Coulomb's and Gauss's Law of Electrostatics. Show that one can be deduced from the other.

(b) Two metal spheres of 3 cm radius carry charges of 10^{-8} and 3×10^{-8} coul and are 2 cms apart. Find the potential at a point mid way between them.

OR

III. (a) Define the term "the moment of an electric dipole".
Derive an expression for the electric intensity due to a dipole at a distance of r along the perpendicular bisector of its axis.

(b) Estimate the field strength and potential at the surface of Na nucleus by assuming it to be an isolated conducting sphere of radius 10^{-8} cm.

IV. Derive the expression for the capacitance of coaxial cable.
Two small raind rops each having the same radius and change coalesce so as to form are larger drop. Find the potential of the new drop.

OR

V. (a) Derive an expression for the capacitance of a parallel plate capacitor when the space between the plate is partially field with a slab of thickness 't' and relative permittivity ε_r.

(b) A parallel plate capacitor having two plates each 100 sq.cm. and 1.2 cm apart has a slab 1.2 cm thick and 5 cm each side. Find the capacity of the condenser. $\varepsilon_r = 2.56$

VI. (a) Derive the expression for the intensity of magnetic field on the axis of Solenoid.

(b) A Solenoid has 10 turns per cm and radius of 8 cms. If a current of 1 amp flows find the force on one half of the Solenoid.

OR

Contd.....3

VII. (a) Derive an expression for the force of attraction or repulsion for two long current carrying conductors placed parallel to each other.

(b) A 1 amp current passes through a metal of 0.5 cm wide and 0.1 mm thick parallel to its length and a Magnetic field of 1 web/m^2 is applied perpendicualr to the flat surface. If atomic weight is 108 is 10.5 m/cm^3. Find the Hall Voltage.

VIII. (a) Explain mathematically when the current in an AC circuit consisting of a reistance and inductance become watt less.

(b) Find the natural frequency of a circuit in which $L = 50\ \mu H$ and $C = 5\ pF$. Find the wavelength to which it responds.

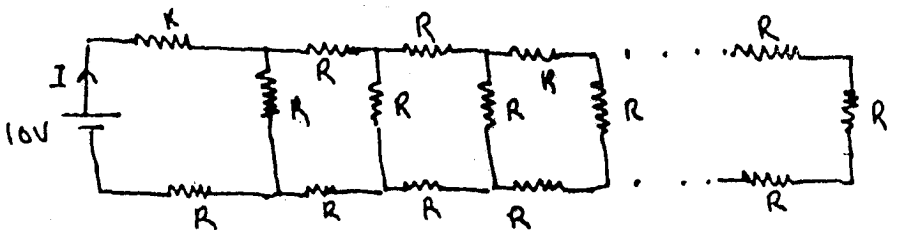
OR

IX. (a) Explain how a rotating magnetic field is produced and how it is used in the construction of an inductive motor.

(b) A step up transformerr opening at 220v and supply a load of 2 amp. The transformer ratio 1.75. Determine the secondary voltage, current and power output. The efficiency is 87%.

X. (a) State and prove the maximum power transfer theorem.

(b) Calculate the current through the Ckt.

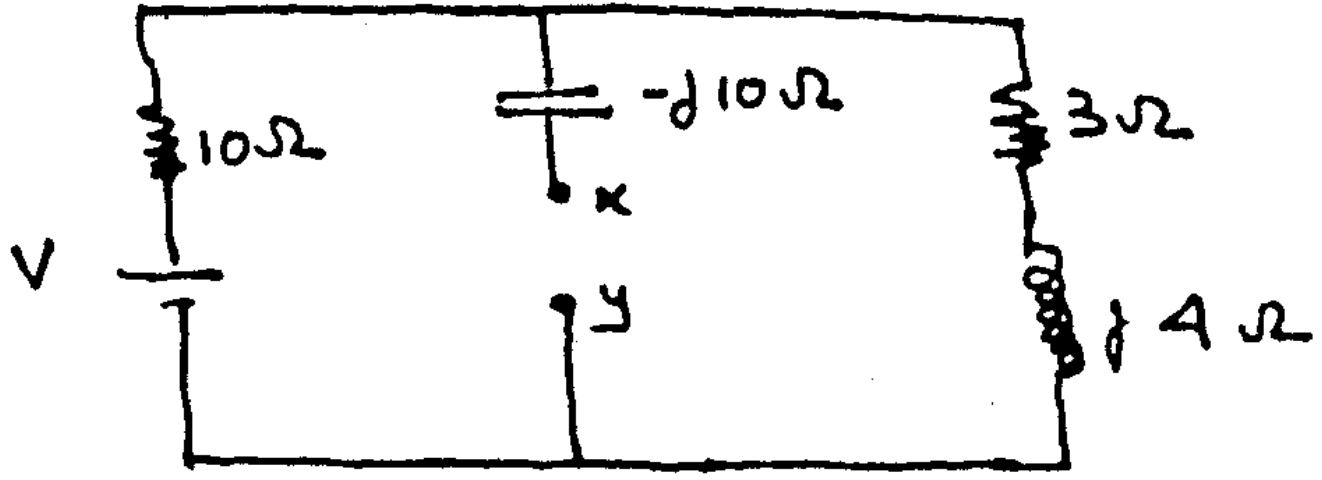


OR

Contd.....4.

XI. (a) With relevant theory explain the working of a Ballistic Galvanometer.

(b) Obtain the Thevenin equivalent for the circuit at terminal xy.



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