This question paper contains 4 printed pages.

4606 *Your Roll No.* .....

B.Sc. Prog. / II AS

PH–201 : PHYSICS

(Electricity, Magnetism and Electromagnetic Theory)

(Admissions of 2008 and onwards)

Time : 3 hours *Maximum Marks* : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.
Question No. 1 is compulsory.

1. Attempt any *five*:

   (*a*) Show that $\vec{\nabla}.(\vec{\nabla}\times\vec{A})=0$.

   (*b*) Using Biot-Savart law prove div $\vec{B}=0$.

   (*c*) Show that under static conditions the charge resides on the outer surface of a charged conductor.

   (*d*) Show that the displacement current in the dielectric of a parallel plate capacitor is equal to the conduction current in the connecting leads.

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(*e*) Explain:

(*i*) 'Brewster's angle

(*ii*) Total internal reflection.

(*f*) Define numerical aperture and acceptance angle of optical fibre.

(*g*) State and prove Norton's theorem of network analysis. What are its limitations? 3×5

2. (*a*) What is meant by gradient of a vector? Give its physical significance.

(*b*) State and prove Gauss divergence theorem of vector analysis. 5,10

3. (*a*) State and prove Gauss's theorem of electrostatics. 8

(*b*) Establish the relation $\vec{E} = -\vec{\nabla} V$ where V is electrostatic potential and E is electrostatic field. 4

(*c*) Hence prove that $\vec{E}$ is conservative. 3

4. (*a*) Give the construction and working of a moving coil ballistic galvanometer and discuss the conditions under which its coil behaves as:

(*i*) Dead beat

(*ii*) Critically damped

(*iii*) Oscillatory

in motion. 10

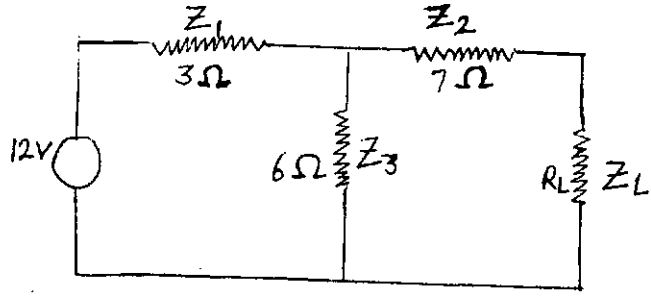
(*b*) Obtain an expression for the magnetic field at the centre of a circular coil carrying a current of I ampere. 5

5. (*a*) Derive Poynting Theorem. Give its physical significance.

(*b*) Enumerate the four Maxwell's equations for free space and write their physical significance. 9,6

6. (*a*) State and prove maximum power transfer theorem.

(*b*) Convert the linear network shown below into Thevenin's equivalent network. 8,7



7. (*a*) Define self inductance. Derive the expression for self inductance of a solenoid.

P. T. O.

(*b*) Derive, using Maxwell's equations, the wave equations for electric and magnetic fields for a plane electromagnetic wave propagating through an isotropic dielectric medium. Hence, show that the velocity of the wave is less than c ($c=3\times10^8$ m/s). 5,10