This question paper contains 3 printed pages.

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B.Sc. Prog. / III

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Paper PH-301- PHYSICS
(ELECTROMAGNETIC THEORY)

Time   3 hours   *Maximum Marks ·75*

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

Attempt any five questions.
All questions carry equal marks.

1. a) Define electric field intensity, electric flux density and electrostatic potential   *05*

    b) State and explain Gauss law in electrostatics. Using Gauss law obtain an expression for electric flux density due to a uniformly charged cylinder.   *10*

2   a) State and explain Faraday's law of em induction of a coil.   *05*

    b) Explain self inductance and mutual inductcance.   *05*

    c) Derive an expression for energy stored in an inductor.
                                                             05

3   a) Explain the principle of wheatstone bridge. Obtain an expression for the null point in the bridge.   *08*

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   b) Describe Wein bridge method to determine the capacitance of an unknown capacitor. **07**

4 a) State and Explain Maxwell's equations in integral and differential forms in free space. **08**

   b) State the boundary conditions for $\vec{B}$ and $\vec{D}$ fields across the interface of two dielectrics under static conditions. **07**

5 a) Discuss the propagation of plane electromagnetic waves in a perfect dielectric. Establish that electromagnetic waves are transverse in nature and hence show that E. H and K form a right handed system. **10**

   b) An electromagnetic wave travels in free space with the electric field component $E = E_0 \sin(wt - \beta_z) a_y$, find D, B and H. **05**

6 a) Briefly explain the concept of total internal reflection using Snell's law. Give two examples. **08**

   b) Calculate the coeffiicents of reflection at normal incidence for a plane wave incident on silver from vaccuum.
     ($w = 10^5 \, H_z$, $\sigma = 6 \times 10^7$ mho). **07**

7 a) What is an optical fiber ? Derive the relation between the numerical aperture and the acceptance angle in optical fibre. **10**

b) Distinguish between left - handed and right handed circularly polarised light.   *05*

8. Write short notes on any *two* of the following :
   i) Poynting theoreom
   ii) Mesh and Nodal analysis
   iii) Properties and application of LCR series resonator
   iv) Plasma.   7½ x 2

200