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RR-0840
Third Year B. Sc. Examination
March / April – 2010
Physics : Paper - VII

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ T.Y. B.Sc.

Name of the Subject :
☛ PHYSICS - 7

☛ Subject Code No. : 0 8 4 0 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Draw a neat diagram wherever necessary.

(3) Symbols used in the paper have their usual meaning.

(4) Figures to the right indicate full marks of the question.

1 Answer the following as required in brief : **14**

(1) Write Laplace's equation in rectangular coordinates.

(2) State Faraday's law of electromagnetic induction.

(3) Write an expression for total energy in electromagnetic wave.

(4) Explain : Magnetic confinement.

(5) State any two properties of glass fibers.

(6) What do you mean by an acceptance angle for optical fiber ?

(7) What are Fresnel's integrals ? What do they represent ?

2 (a) Explain polarization. Discuss the laws of electrostatics in the presence of dielectrics. **7**

(b) Determine the value of individual dipole moment $(\vec{p})$ of a molecule of carbon tetrachloride when the field of $10^7\ V/m$ is applied. (Relative permittivity $\epsilon_r = 2 \cdot 24$, molecular density = $6 \cdot 17 \times 10^{27}$ molecules/m^3, $\epsilon_0 = 8 \cdot 854 \times 10^{-12}\ C^2/N - m^2$) 4

OR

2 (a) Discuss boundary conditions at the interface of two media and discuss which components of $\vec{D}$ and $\vec{E}$ are continuous across the boundary. 7

(b) If θ_1 and θ_2 are the angles between the directions of field and the common normal to the boundary and ϵ_1 and ϵ_2 are relative permittivities of the two media, show that $\epsilon_1 \cot\theta_1 = \epsilon_2 \cot\theta_2$ 4

3 (a) Derive the condition which shows that the behaviour of the material whether dielectric or conductor depends upon the frequency of the electromagnetic waves. 7

(b) Find the speed of propagation of electromagnetic wave where $\mu_0 = 4\pi \times 10^{-7}\ N \cdot \sec^2/C^2$ and $\epsilon_0 = 8 \cdot 8542 \times 10^{-12}\ C^2/N \cdot m^2$ 4

OR

3 (a) What is plasma ? Discuss the behaviour of plasma particle in non-homogeneous magnetic field. 7

(b) Obtain integral and differential forms of Faraday's law of electromagnetic induction. 4

4 (a) With proper diagram, explain the construction of Cornu's spiral. 7

(b) In Echelon grating experiment, the refractive index of the plates is 1·5 and the maximum order 'n' is 10000 for light of wavelength 5000 $\mathring{A}$. Determine the thickness of each plate. **4**

OR

4 (a) Discuss the idea, construction and working of Lummer Gehrecke plate. **7**

(b) In an optical fiber, the refractive index of the core material is 1·6 and that of cladding material is 1·3. Find the value of critical angle and the angle of acceptance of the fiber. **4**

5 (a) Describe the main components required in Laser. **6**

(b) Describe the requirements in holography. **5**

OR

5 (a) Explain Einstein's coefficients. **6**

(b) Discuss attenuation in optical fiber. **5**

6 Explain in detail any two of the following : **12**

(a) Poynting vector and its physical significance.

(b) Total internal reflection in optical fiber.

(c) Hysteresis

(d) Haidinger's fringes.
