



DPP-1412
M. Sc. (Sem. II) (Physics) Examination
April/May - 2016
PH-423 : Classical Electrodynamics &
Plasma Physics

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1)

<p>नीचे दशांकेव निशानीवाणी विगतो उत्तरवडी पर अवश्य लखवी. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination :</p> <p>☛ M. Sc. (Sem. II) (Physics)</p> <p>Name of the Subject :</p> <p>☛ PH-423 : Classical Electrodynamics & Plasma Physics</p> <p>☛ Subject Code No. : 1 4 1 2 ☛ Section No. (1, 2,.....): Nil</p>	<p>Seat No. :</p> <table border="1" style="width: 100%; height: 20px;"><tr><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td><td style="width: 15%;"></td></tr></table> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; text-align: center; margin-top: 10px;">Student's Signature</div>						

- (2) Symbols used have their usual meaning.
(3) Figures to the right indicate full marks.

- 1 Write any two out of the (A), (B) and (C) below
- (A) Write down Laplace's equation in spherical co-ordinates and obtain its solution. 7
- (B) (i) State and prove Gauss theorem. 4
(ii) Use the Gauss theorem of find expressions for the field strength due to (a) a uniformly charged, 3
(b) an infinite uniform flat sheet of charge.
- (C) (i) What do you mean by a plasma ? Discuss the conditions for the existence of a plasma. 4
(ii) Write short notes on Pinch effect in Plasma. 3
- 2 Write any two out of the (A), (B) and (C) below
- (A) Show that the potential the electrical potential varies inversely as the cube of distance. 7

- (B) (i) What are polar and non-polar molecules of a dielectric ? 4
- (ii) Define Dielectric constant and Displacement vector and derive relation between them. 3
- (C) Derive multipole expansion of electric field. 7
- 3 Write any two out of the (A), (B) and (C) below
- (A) Why the discussion of magnetostatics is more complicated than that of electrostatics? Derive Ampere's law of force between current elements. 7
- (B) (i) Write Biot-Savart law and show that it is very convenient to evaluate the magnetic induction B . 7
- (ii) Derive magnetic field due to solenoid.
- (C) Differentiate between magnetic vector potential and magnetic scalar potential. Derive expression for the magnetic vector potential and magnetic induction due to a small element of a current carrying current at a large distance. 7
- 4 Write any two out of the (A), (B) and (C) below
- (A) Introduce Phasor notation and show the relationship between time varying and phasor notation by diagram. Derive Maxwell's equations in Phasor form. 7
- (B) Derive the electromagnetic wave equation from Maxwell's field equations. Consider plane wave solutions of this equation and prove that the energy density associated with such a wave in a stationary homogeneous non-conducting medium propagates with the same speed with which the fields do. 7

- (C) What is Skin depth δ ? What factors does it depend on? 7
Derive an expression for δ for a medium of finite conductivity σ . Find the Skin depth δ for low frequency radio waves of wave length 3×10^8 meter in sea water the electrical conductivity $\sigma = 4$ ohm/meter.
- 5 Write any two out of the (A), (B) and (C) below
- (A) What are retarded potential? Explain and describe 7
the retarded potential satisfy the inhomogeneous wave equation in QED.
- (B) Calculate parameters vector potential and Scalar 7
potential due to due to an oscillating dipole.
- (C) Using knowledge of parameters vector potential A and 7
Scalar potential Φ Calculate magnetic field induction B and electric field strength.
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