

Reg. No. :

Name :

First Semester M.Sc. Degree (Reg./Suppl./Imp.)
Examination, October 2018
(2014 Admn. Onwards)
PHYSICS
PHY 1C03 : Electrodynamics

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions. (Either **(a)** or **(b)**) : **(2×12=24)**

1. a) Discuss the propagation of plane monochromatic waves in conducting media. Derive the dispersion equation and thus obtain (a) phase velocity (b) refractive index and (c) skin depth.

OR

- b) Give an account of Lienard and Wiechert potentials and find an expression for the field of a charge in uniform motion.
2. a) What are wave guides ? Compare their working with transmission lines. Starting from Maxwell's equations derive expressions for fields above cut off for a rectangular wave guides in TE modes.

OR

- b) Define Lorentz force and find relativistic transformation of force component by expressing the law in the tensor form.

SECTION – B

Answer **any four**. (**One** mark for Part **a**, **3** marks for Part **b**, **5** marks for Part **c**).**(4×9=36)**

3. a) Define Gauss law.
 b) Explain Ampere's theorem.
 c) Calculate the position and magnitude of the image charge for a charge $+3C$ placed at a distance of 30 units from a grounded conducting sphere of radius 2 units.

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4. a) What is Poynting vector ?
b) Show that Electromagnetic wave is a transverse wave.
c) Calculate skin depth of silver which has a conductivity 3×10^7 S/m at 10 GHz and 50 Hz and compare the results.
 5. a) What is Brewsters law ?
b) Write a note on cavity resonators.
c) A rectangular waveguide has dimensions of 2.5 cm and 5 cm. Determine guide wave length phase velocity and phase constant at a wave length of 4.5 cm for dominant mode.
 6. a) Define Electric dipole radiation.
b) Write a note on radiation reaction.
c) Derive Abraham Lorentz equation of motion.
 7. a) Define four vectors.
b) Write a short note on electromagnetic field tensor.
c) If an electrostatic electric field E is represented as $E = (400i + 500j)$ V/m then represent it in a frame of reference moving with a velocity $V = (4i + 3j) \times 10^7$ m/s relative to static charges..
 8. a) What do you mean by gauge transformations ?
b) Write a note on Retarded potentials.
c) If the retarded scalar electric potential $V = x - v_0 t$ and vector magnetic potential $A = (x/v_0 - t) a_x$, where v_0 is the velocity of propagation. Find B, H, E and D.
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