

## First Semester Examination-2017

M.Sc. PHYSICS

Paper Code: PHS-103

Full Marks : 40

Time: 2 Hours

Use Separate scripts for Group A &amp; Group B

Group A

ELETRODINAMICS

Answer any five from Q.1 and any one for Q.2 and Q3 5×2=10

1. (a) Write down the differences between Cyclotron and Bremsstrahlung radiation loss ?
- (b) Define  $\vec{E}$  and  $\vec{B}$  in terms of  $\vec{A}$  and  $\phi$ ?
- (c) What is quasi-neutrality?
- (d) Show that the charge measured in S'-frame is the same that in S frame, while the charge density is Not same as that in the S frame, while the charge density is not?
- (e) What is ambipolar diffusion?
- (f) What do you mean by classical radius of electron?
- (g) Show that 3 dimensional Laplacian is not invariant under Laurent Transformation?
- (h) Show that electromagnetic field vectors are gauge invariant?
- 2.(a) From the concept of radiation from an accelerated charge at high velocity derive relativistic Generalization of Larmor's formula? 5
- (b) Hence discuss the following cases 2
  - i) If the motion of the particle is non-relativistic. 2
  - ii) If the motion of the particle is such that its velocity and acceleration are parallel. 1
- (c) What are Lienard-wiechert potentials? 1
3. Define differential scattering cross-section .Deduce the expression for the Rayleigh Scattering Co-efficient. 2+8



**Group-B****Answer Q. No.1 and any one from the rest****(MATERIALS SCIENCE)****Q.1 Answer any five****5×2=10**

- (a) what is Molecular Beam Epitaxy (MBE)
- (b) What are Nano materials? Why quantum effect is noticed in those materials.
- (c) Why high vacuum is essential when a film is grown by thermal evaporation.
- (d) What is XPS?
- (e) What is surface probe microscopy (SPM)? Name three SPM instruments?
- (f) What is sputtering technique of this film characterization?
- (g) Write down the uses of AFM in this film characterization?
- (h) Why electron microscope in nanomaterial characterization?

Q.2. (a) Describe the working principal of TEM with Schematic diagram? 5

(b) Compare SEM and TEM? 3

(c) Mention the application of TEM? 2

Q.3 (a) Write short notes on Sol-Gel technique 4

(b) Compare evaporation and Sputtering 2

(c) Write down the basic principal of UV-VIS-NIR Spectroscopy? Also write down the names of the components of UV-VIS-NIR Spectrophotometer? 4

