PG/IIS/PHS-203/14

M.Sc. 2nd Semester Examination 2014

PHYSICS

PAPER – PHS-203(Gr.-A + Gr.-B)

Full Marks : 40

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP–A

[*Marks* : 20]

Answer **Q.No.1** and any **one** from the rest

1. Answer any *five* : 2 × 5

(*a*) What do you mean by Debye shielding ? Write the expression for 'Debye-length'.

(*b*) In plasma physics, usually temperature is given in unit of energy, Show that for 1 eV the temperature is approximately 10^4 K.

(*c*) Draw the Schematic circuit of a inductively coupled toroidal discharge system for the study of the breakdown process of air with 1 torr pressure.

(*d*) Write and discuss the essential quantities which are used to describe the characteristics of plasma.

(*e*) Write the principle of MHD-generator.

(*f*) How is the plasma pressure in a toroidal pinch device balanced ?

(*g*) Write the names of the processes of plasma production.

(*h*) What is Saha Equation ? What are its applications ?

2. Draw a diagram of low-pressure electrical gas discharge system. With the help of Townsend advanced theory of Collision by ionization deduced the Paschen's law and present graphical verification for different gases. 3 + 5 + 2

3. What are the plasma parameters ? Discuss the method of determining the plasma parameters by single probe method. 2 + 8

GROUP–B

[*Marks* : 20]

Answer **Q.No.1** and any **one** from the rest

1. Answer any *five* bits : 2 × 5

   (*a*) What is Cherenkov radiation ? What is the condition of emission of Cherenkov radiation ?

   (*b*) Mention the processes by which energy is lost from plasma in the form of radiation.

   (*c*) What is resonance scattering ?

   (*d*) What is 'ambipolar diffusion' ?

   (*e*) Define the distribution function in phase space under plasma kinetic theory.

(*f*) Show that refractive index of plasma medium,

$$n = \sqrt{1 - w_p^{\,2} / w^2} \quad ;$$

where w_p = plasma frequency ; w = frequency of e.m.w.

(*g*) What do you mean by 'radiation resistance' ?

(*h*) Show that the charged particles which more with constant velocity cannot radiate.

2. (*i*) Show that for plasma, the diffusion of ions across the mag. field will be greater as compared to that of electrons.

(*ii*) Deduce Vlasov equation for plasma. 6 + 4

3. What is Lienerd-Wiechert potential ? Obtain the Lienard-Wiechert scalar potential of a particle having charge q and moving with velocity $\vec{v}$. Find the electric field from this for a uniformly moving electron. Sketch the direction of electric field. How would the field behave for a high velocity electron ? 1 + 3 + 4 + 1 + 1
