M.Sc. 2nd Semester Examination, 2010

PHYSICS

PAPER—PH-1203

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

PAPER—1203 A

[*Marks* : 20]

1. Answer any *five* questions from the following : 2 x 5

   (*a*) What are few entities ? Which are essential to describe the characteristics of plasma ?

(*b*) How plasma pressure in a pinch device is balanced ?

(*c*) With proper diagram explain Kink instability in a plasma.

(*d*) Name the different plasma radiations that operate in the optical range and in the far ultraviolate region.

(*e*) Mention and discuss a suitable method for determining of all the plasma parameters in a low pressure gas discharge.

(*f*) Illustrate the basic schemes for plasma confinement in magnetic field configuration.

(*g*) State few fusion reaction in controlled thermonuclear reaction in a fusion reactor.

(*h*) What do you mean the plasma propulsion system ?

2. Answer any *one* bit : 10×1

(*a*) In free-free charge system state the process of recombination in radiation loss, graphically discuss

(*i*) the density decay curves with time of weakly ionised plasma under recombination and diffusion (in electron-ion).

(*ii*) the recombination coefficient data as a function of time (ion-ion recombination). $2 + 4 + 4$

(*b*) Establish the dispersion relation for plasma oscillation and show that when wavelength is large the oscillations propagate as sound waves. $8 + 2$

PAPER—1203 B

[*Marks* : 20]

3. Answer any *five* bits : 2×5

(*a*) Show that the charge measured in S' is the same as that in S-frame, while the charge density is not.

(*b*) What is Dirac δ-function ? Write its properties.

(*c*) What is resonance scattering ? Give an example.

(*d*) What is radiation resistance ? Write an expression for it.

(*e*) Show mathematically that charge resides on the surface of a good conductor.

(*f*) Show that field vectors are gauge in variant.

(*g*) Starting with $\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$, show that $\nabla \cdot \vec{D} = \rho$.

(*h*) Write the boundary conditions for the electromagnetic field vectors.

4. Answer any *one* from the following : 10×1

(*a*) (*i*) Show that the potentials at the position defined by the vector $\vec{r}$ in uniform electric and magnetic fields may be written as :

$$\phi = -\vec{E} \cdot \vec{r} \; ; \quad \vec{A} = \frac{1}{2}(\vec{B} \times \vec{r})$$

(*ii*) Deduce Maxwell's field equations in terms of electromagnetic potentials. 6 + 4

(*b*) What do you mean by 'oscillating dipole' ? Find the expression for $\vec{E}$ for an oscillating dipole. Explain different terms of the expression. 2 + 6 + 2
