Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 11

M.Sc. (Physics) (Campus) (2016 Onwards) (Sem.–3)

PLASMA PHYSICS

Subject Code : PHS-536

M.Code : 51227

Time : 3 Hrs. **Max. Marks : 70**

INSTRUCTIONS TO CANDIDATES :

1. **Section-A is compulsory consisting of TEN questions carrying TWO marks each.**
2. **Section-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.**
3. **Section-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a) Write some natural and artificial sources of plasma occurrence.

b) Compute λ_D and N_D for a glow discharge, with $n=10^{16}cm^{-3}$ and $KT_e = 2eV$.

c) Give the basic working principle of energy analyzers.

d) Explain, how the combination of grad-drift velocity and curvature-drift velocity work on plasma particles?

e) What are the consequences of particle motion in large amplitude waves?

f) Write the MHD approximations commonly used in one fluid equation theory.

g) Differentiate between generation conditions for Alfven waves and Magneto sonic waves in plasma.

h) State the difference between dielectric constants of field free plasma and cold magnetized plasma.

i) Differentiate between linear and non-linear Landau damping.

j) Write drift kinetic equation and its properties.

SECTION-B

2. Explain the elementary concepts and definitions of different types of plasma temperatures.

3. Derive ionization expression in terms of E/P based on Townsend's theory of gas discharge.

4. Describe the principle of magnetic probe technique for plasma diagnostics, draw its circuit diagram, explain working/procedure and V-I characteristics with due explanation to each portion of the curve.

5. Define gard-B drift and derive the expression for grad-B drift velocity of guiding centre.

6. Define space charge waves of warm plasma; explain their origin and derive the expression for their dispersion relation.

7. Derive the expression for dielectric constant of field free plasma.

8. Explain briefly the different types of parametric instabilities in plasma.

SECTION-C

9. Give a brief review about following applications of plasma:

   a) Controlled thermonuclear fusion

   b) Gas discharge

   c) Power generation

   d) Ion propulsion

   e) Solid state plasma

10. Using appropriate equations of motions for a particle in a varying magnetic field, derive the expression for the average force acting on the particle as well as magnetic moment of the particle.

11. Derive the dispersion relation for the propagation of electromagnetic waves in plasma when no magnetic field is applied ($B_0 = 0$).

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.