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

Total No. of Questions : 11

M.Sc. (Physics)EL-II (2018 Batch) (Sem.-3)

PLASMA PHYSICS

Subject Code : MSPH537-18

M.Code : 76756

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. Write briefly :

a) Write three conditions plasma must satisfy.

b) Compute λ_D and N_D for the earth's ionosphere with $n = 10^6$ cm^{-3} and $KT_e = 0.1eV$.

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 macroscopic parameters of plasma.

g) Differentiate between lower hybrid and upper hybrid waves in plasma.

h) Write one and two fluid equations for plasma.

i) What do you understand by plasma instabilities?

j) Write Vlasov equation and its properties.

SECTION-B

2. Explain Debye shielding in plasma and derive its formula as : $\lambda_D = \left(\frac{KT_e}{4\pi ne^2} \right)^{1/2}$

3. Derive ionization expressions in terms of E/P based on Townsend's theory of gas discharge and discuss different regimes of E/P in a discharge.

4. Describe the principle of double 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 Curvature-B drift and derive the expression for curvature-B drift velocity of guiding centre.

6. Define Ion-Acoustic waves plasma; explain their origin and derive the expression for their dispersion relation.

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

8. What do you mean by plasma stability analysis? Derive the dispersion relation for high frequency plasma oscillations considering two-stream instability in plasma.

SECTION-C

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

   a) Controlled thermonuclear fusion

   b) Space Physics

   c) MHD energy conversion

   d) Ion propulsion

   e) Gas lasers

10. Using appropriate equations of motions for a particle in time varying electric and magnetic field derive the expression for velocity and positions coordinates.

11. Derive the dispersion relation for the propagation of electromagnetic waves in plasma when $E_1 \perp B_0$.

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.