



**MBV-003-0494007** Seat No. \_\_\_\_\_

**B. Sc. / M. Sc. (Applied Physics) (Sem. IV)  
(CBCS) Examination**

**April / May - 2018**

**Electrodynamics & Plasma Physics : Paper - XVI  
(New Course)**

**Faculty Code : 003**

**Subject Code : 0494007**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :** (1) All questions are compulsory  
(2) Numbers in the right margin indicate marks

- 1** Attempt any **seven** short questions : **14**
- (1) Define PLASMA state of matter.
  - (2) List the applications of Plasma
  - (3) What are Plasma Oscillations? Draw a well labelled diagram of Plasma Oscillations.
  - (4) State Coulomb's law. Write its mathematical expression.
  - (5) Define electric field intensity. Write the expression for point charge.
  - (6) Define an electric dipole? Write its importance.
  - (7) Define dielectric constant and strength.
  - (8) Write down the Poisson's and Laplace's equations.
  - (9) Draw a well labelled diagram of Debye Effect in Plasma.
  - (10) What is invariance of magnetic moment  $\mu$  in Plasma.

- 2** (A) Write answers of any **two** : **10**
- (1) Define Faraday's law in electrostatics. Also, derive relationship between electric field intensity and electric flux density.
  - (2) Drive an expression of Maxwell's Equation: Ampere's Circuit Law.
  - (3) Write a brief note on Coulomb's law with its applications and limitations.
  - (4) What is continuity equation? Derive it and also, KCL from it.
- (B) Write answer of any **one** : **4**
- (1) Write a short note on electric scalar potential.
  - (2) Write a brief note on energy density in electrostatic field.
- 3** (A) Write answers of any **two** : **10**
- (1) Derive Maxwell's first equation: Conservative nature of electrostatic field.
  - (2) Write a note on Magnetic flux density.
  - (3) Write a note on Magnetic boundary conditions.
  - (4) State and explain Biot Savart's Law.
- (B) Write answer of any **one** : **4**
- (1) Write mathematical expression of Poynting's theorem and explain each term with necessary figures.
  - (2) Write a brief note on Polarization in dielectric.
- 4** (A) Write answers of any **two** : **10**
- (1) Derive an expression for the potential  $\phi$  in Debye sphere and hence describe what is significance of Debye Length in Plasma.

- (2) Explain various methods for the production of Plasma.
- (3) Explain why plasma can not occur naturally on earth. Give the list of natural and artificial occurrence of Plasma.
- (4) Describe various properties of Plasma.

(B) Write answer of any **one** : 4

- (1) Compute  $\lambda_D$  and  $N_D$  for the following
  - (a) a glow discharge with  $n = 10^{16} m^{-3}$  &  $kT_e = 2eV$
  - (b) a  $\theta$  – pinch with  $n = 10^{23} m^{-3}$  &  $kT_e = 800 eV$
- (2) Discuss various applications of Plasma.

5 (A) Write answers of any **two** : 10

- (1) What is magnetic mirror effect in Plasma? Comment on diamagnetic nature of Plasma.
- (2) Describe the effect of curved magnetic field on the motion of charged particle plasma.
- (3) Obtain a fluid equation for plasma and compare it with ordinary fluid equation.
- (4) Derive an expression for the frequency of plasma oscillations.

(B) Write answer of any **one** : 4

- (1) Describe the effect of uniform B on the motion of charged particle in Plasma.
- (2) Explain the effect of GRAD B field applied perpendicular to B in plasma.