

**Bsc 2<sup>nd</sup> Semester (Honours)**  
**PHY-HC-2016**  
**Total Marks:30**

**Unit I: Electric Field and Electric Potential**

- 1 (a) Calculate the magnitude of an electric field which can just suspended a deuteron of mass  $3.2 \times 10^{-27}$  kg freely in air. 2
- (b) Two point charges  $2\mu\text{C}$  and  $8\mu\text{C}$  are placed 12cm apart. Find the position of the point where the electric field intensity will be zero. 2
- (c) A rectangular surface of sides 10 cm and 15 cm is placed inside a uniform electric field of 25 N/C, such that normal to the surface makes an angle of  $60^\circ$  with the direction of electric field. Find the flux of electric field through the rectangular surface. 3
- (d) An infinite line charge produces a field of  $9 \times 10^4$  N/C at a distance of 0.02 m. Calculate the linear charge density. 3
- (e) Given electric field in the region  $E = 5x \mathbf{i} + 3y \mathbf{j} + 6z \mathbf{k}$ . Calculate the volume charge density. 3
- (f) Two thin metal plates are parallel and close to each other. On inner faces of metal plates have surface charge densities of magnitude  $15 \times 10^{-24}$  C/m<sup>2</sup> each but of opposite signs. Find the electric field intensity in the region. (i) Outer region of first plate (ii) Outer region of second plate (iii) Between the plates. 3
- 2 (a) A region is specified by the potential function given by  $V=4x^2+3y^2-9z^2$ . Calculate the electric field at the point (3,4,5) in the region. Find the magnitude of electric field at that point. 3
- (b) Show that the potential function  $V= 2x^2-2y^2+4z$  satisfies Laplace's equation. 3
- (c) What is equipotential surfaces? 1
3. Two capacitors of capacitance  $C_1=2\mu\text{F}$  and  $C_2=8\mu\text{F}$  are connected in series and the resulting combination is connected across 300 volts. Calculate the charge, potential differences and energy stored in the capacitor separately. 3
4. What is method of images? 1

**Unit IV: Magnetic Properties of Matter**

5. Define 3
- (i) Magnetic moment of a magnetic dipole (M)
- (ii) Magnetic Intensity (I)
- (iii) Magnetic Susceptibility ( $\chi$ )
- (iv) Magnetic Permeability ( $\mu$ )
- (v) B-H curve and hysteresis
- (vi) Coercivity and Retaintivity