

Mid-West University

**Examinations Management Office**

Birendranagar, Surkhet

**End Semester (Alternative/Physical) Examinations -2078**

Bachelor level/ B.Sc /4<sup>th</sup> Semester

Full Marks : 60

Time: 3hrs

Pass Marks : 30

**Subject : Electromagnetism (PHY341)**

*Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.*

**Answer all the following questions**

**[6x10= 60]**

1. a) Discuss the method of electrical image and use it to calculate the potential and electric field due to point charge near a earthen sphere. [5]  
b) What do you mean by a divergence of vector field? Derive the expression for divergence of vector field  $\vec{A}$  in Cartesian co-ordinate system. [5]
2. a) Evaluate,  $\nabla^2\left(\frac{1}{r}\right)$ , where,  $r = \sqrt{x^2 + y^2 + z^2}$ , And show that  $\phi = q\left(\frac{1}{\sqrt{x^2+y^2+z^2}}\right)$  satisfy the Laplace's equation. [5]  
b) Define energy density in electrostatic field. Derive the expression for it. [5]
3. a) Write the importance of boundary conditions satisfy by Electric and magnetic fields in between two dielectrics? Discuss the dielectric-dielectric boundary condition for Electric field ( $\vec{E}$ ). [5]  
b) State and prove Amperes circuital law. For which condition this law is useful for determination of magnetic field? [5]

**OR**

- a) Derive the continuity equation and show that volume charge density of any charge is decay exponentially. [5]
- b) Define magnetic torque and magnetic moment? Derive the relation between them. [5]

4. a) Define solid angle and magnetic scalar potential? Obtain an expression for magnetic scalar potential. [5]  
b) Write Maxwell's equation in free space,? Deduce the equation for the propagation of electromagnetic wave in free space. [5]
5. a) Define Magnetic susceptibility and relative permeability? then, derive a relation,  $\vec{B} = \mu_0(\vec{M} + \vec{H})$  [5]  
b) A parallel plate capacitor with plate area  $5cm^2$  and plate separation of 3mm has a voltage  $50\sin 10^3 t$  V applied to its plates. Calculate the displacement current assuming  $\epsilon = 3\epsilon_0$ . [5]

**OR**

- a) Define lossy dielectrics and derive the electric and magnetic field equation in lossy dielectric. [5]
- b) Define Smith Chart and write its application in transmission line? Show that total power of transmitted line is equal to the sum of incident and reflected power. [5]
6. a) For the current density  $\vec{J} = 10z\sin^2\theta a_\rho A/m^2$ , Calculate the current passing through the cylindrical surface,  $\rho = 2, 1 \leq z \leq 5m$ . [5]  
b) Show that the general expression for input impedance at any point on transmission line is,  
$$Z_{in} = Z_0 \left[ \frac{Z_L + Z_0 \tanh \gamma l}{Z_0 + Z_L \tanh \gamma l} \right]$$
, Where symbol have usual meaning. [5]

**THE END**