Examination B. Sc Semester – II

Physics (CBCS)

Course No: PHTH – 201

Time allowed: 3 hrs Max. Marks: 80

Note: A candidate has to attempt all the question from section A & B and any two questions from section C.

## SECTION – A

(Short answer question)

Q.1. What do you understand by irrational vector field? Give its properties. (3)

Q.2. Define electric flux. Obtain mathematical expression for it. (3)

Q.3. Obtain Ohm's law in microscopic form. (3)

Q.4. What do you mean by self inductance? On what factors it depends. (3)

Q.5. Write Maxwell's equations in differential form and how they take the form in free space. (3)

## SECTION – B

(Medium answer question)

Q.6. Give physical significance curl of a vector. (7)

Q.7. Derive Poison's and Laplace's equations starting from differential form of Gauss's law. (7)

Q.8. State and prove Ampere's circuital law and also express it in differential form. (7)

Q.9. Obtain relation between mutual inductance and self inductance of two coils. (7)

Q.10. Prove that electromagnetic waves are transverse in nature. (7)

## SECTION – C

(Long answer question)

Q.11. a) State and prove Gauss's divergence theorem. (10)

b) Prove that $\nabla.(\nabla x\mathbf{A}) = 0$, where **A** is a vector.

Q.12. a) Drive an expression for energy stored per unit volume in a dielectric medium. (10)

b) The electric potential in a certain region of space is given by $V(x, y, z) = 50x^2 – 75y$. Find (a) magnitude of electric field at the point (11,0) (b) is the electric field uniform. (5)

Q.13. a) Define magnetic vector potential and derive an expression for it. (10)

b) What do you understand by the term magnetic susceptibility and magnetic permeability? Derive relation between them. (5)

Q.14. State and prove Poynting theorem. (15)

Q.15. a) State Maxwell's equation for conducing medium and derive the wave equations for the electromagnetic waves. (10)

b) Calculate the skin depth for a frequency 1010Hz for silver. Given $\sigma = 2x107\ Sm^{-1}$ and $\mu = 4\pi x10^{-7}\ Hm^{-1}$ where the symbols have their usual meaning. (5)