

**B.Tech. (Sem. - 5<sup>th</sup>)****ELECTROMAGNETIC FIELD THEORY****SUBJECT CODE : EE - 303****Paper ID : [A0414]**

[Note : Please fill subject code and paper ID on OMR]

**Time : 03 Hours****Maximum Marks : 60****Instruction to Candidates:**

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

**Section - A****Q1)****(10 x 2 = 20)**

- a) Differentiate between scalar field and vector field. Give examples.
- b) Define Divergence theorem.
- c) State Biot-savart law.
- d) What do you mean by equipotential surfaces?
- e) State the conditions at a boundary between dielectric and conducting surface.
- f) Give the expression for energy stored in static electric field.
- g) What is Ampere's law?
- h) What is displacement current? Does it exist in free space or not?
- i) Define magnetic field intensity and give its relation with magnetic flux density.
- j) What do you understand by homogeneous and isotropic medium?

## Section - B

(4 x 5 = 20)

- Q2) State and prove Gauss's law.
- Q3) Write Maxwell's equation in time varying fields and give their interpretation.
- Q4) Find an expression for the magnetic flux density B at a distance 'h' above the centre of rectangular loop of wire 'b' meter on one side and 'a' meter on other side. The loop carries a current of 1 amp.
- Q5) State and prove Poynting theorem.
- Q6) Differentiate between linear, elliptical and circular polarization.

## Section - C

(2 x 10 = 20)

- Q7) (a) Discuss analogies between electric and magnetic fields.  
(b) Develop an expression for the potential difference at any point between spherical shells in terms of the applied potential employing Laplace's equation.
- Q8) (a) Differentiate between phase velocity and group velocity. Calculate the velocity of electromagnetic wave in a medium whose dielectric constant is 2.56.  
(b). A plane electromagnetic wave travelling in free space has an amplitude of  $E_0$  equal to  $50 \mu\text{V/m}$  and the electric field vector at any point varies sinusoidally with time. What are the peak and average values of Poynting vector.
- Q9) Write short notes on the following:  
(a) Uniqueness theorem.  
(b) Reflection at surface of conducting medium.

