# Department of Physics (Bennett University)
# EPHY105L (I Semester, 2020-21)

## Tutorial Set - 8

1. A parallel plate capacitor with plate separation of 0.6 mm and filled with free space has an applied peak voltage of 25 V at a frequency of 100 MHz. Find the peak value of displacement current density. [Ans: ~ 231.7 A/m$^2$]
2. Consider a parallel plate capacitor with circular plates having a radius of 5 cm and plate separation of 0.5 mm and filled with free space. A peak voltage of 20 V at a frequency of 20 MHz is applied across the plates. Neglecting end effects in the capacitor calculate
   a) The peak value of displacement current density [Ans: 44.5 A/m$^2$]
   b) The magnetic field at the mid plane between the capacitor plates at a distance of 2 cm from the axis. [Ans: ~ 5.6x10$^{-7}$ T]
   c) The magnetic field at the mid plane between the capacitor plates at a distance of 10 cm from the axis. [Ans: ~ 7x10$^{-7}$ T]
   d) At what distance from the axis will the magnetic field be highest?
3. Consider an infinitely long air core tightly wound straight solenoid having N turns per unit length and carrying a current given by $I = I_0 \sin\omega t$ . Obtain the induced electric field $\vec{E}$ within the interior of the solenoid and outside the solenoid.
4. An electromagnetic wave propagating in free space is described by the following expression for the electric field :

$$\vec{E} = \vec{E}_0 \cos[(5 \times 10^6 x + \omega t)]$$

   a) What is the value of $\omega$?
   b) What is the wavelength of the wave?
   c) What will be the direction of propagation of the wave?
   d) If $\vec{E}_0 = E_0 \hat{y}$, what will be the direction of the corresponding $\vec{B}$ of the wave?