K15F 0159

**V Semester B.Tech. Degree (Reg./Sup./Imp.-Including Part Time)
Examination, November 2015
(2007 Admn. Onwards)
PT2K6/2K6 EC 503 : APPLIED ELECTROMAGNETIC FIELD THEORY**

Time : 3 Hours

Max. Marks : 100

Instruction : Answer all questions.

1. a) Explain the concept of electric flux.

   b) Derive an expression for capacitance of an isolated sphere.

   c) State and explain Biot-Savart's law.

   d) What is meant by magnetic dipole ? Explain.

   e) Calculate Brewster angle for quartz (dielectric constant is 2.3)

   f) Define poynting vector. Explain its significance.

   g) Write down Maxwell's equations for free space and explain.

   h) Write a note on impedance matching.   (8×5=40)

2. a) P(1, 1, 3) is a point in rectangular coordinate system. Express it in (i) cylindrical
      (ii) spherical and (iii) change directly from cylindrical to spherical coordinate
      system.   7½

   b) Determine the variation of field and potential due to a spherical volume
      distribution of charge. Plot the relevant curves.   7½

                          OR

   c) Four positive charges of 10^{-9}C each are situated in x – y plane at (0, 0), (0, 1),
      (1, 1) and (1, 0) m. Find electric field and potential at (½, ½) m. Derive the
      relations used .   10

   d) State and explain Gauss's law.   5

3. a) A 400 turn solenoid is one metre long and has a diameter of 0.1 m. Find its inductance and energy stored in the magnetic field when a current of 4 A flows in it. Derive the equations used.   **15**

   OR

   b) Derive an expression for self inductance of a toroid.   **5**

   c) Explain Faraday's laws of electromagnetic induction.   **5**

   d) Compare scalar and vector magnetic potentials.   **5**

4. a) Obtain wave equations for dielectric.   **8**

   b) A 2.5 mm diameter copper wire carries a conduction current of 1 A at 60Hz. What is the displacement current in the wire ? Given $\epsilon = \epsilon 0, \mu = \mu 0, \sigma = 5.8 \times 10^7$. Derive the equation used.   **7**

   OR

   c) Find the conditions for which a uniform plane wave in free space is linearly and circularly polarized.   **8**

   d) State and prove Poynting theorem.   **7**

5. a) Discuss about the propagation of waves through conductors.   **10**

   b) Write a note on Smith Chart.   **5**

   OR

   c) Define and explain the meaning of standing wave ratio. Derive a formulae for it. How can it be reduced ?   **10**

   d) What is phase velocity ? Explain.   **5**