Code No: R5211001 **R5**

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
(Electronics & Instrumentation Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for the electric field intensity due to a finite length line charge along the z-axis at an arbitrary point Q(x, y, z).
   (b) Find the force on a $100\mu C$ charge at (0, 0, 3)m if four like charges of $20\mu C$ are located on x and y axes at ± 4m. [8+8]

2. (a) State Biot- Savart law
   (b) Derive an expression for magnetic field strength, H, due to a finite filamentary conductor carrying a curent I and placed along Z- axis at a point 'P' on y-axis. Hence deduce the magnetic field strength for the length of the conductor extending from - ∞ to + ∞. [4+12]

3. (a) What is the inconsistency of Amperes law?
   (b) A circular loop conductor of radius 0.1m lies in the z=0plane and has a resistance of 5Ω given B=0.20 sin 10^3 t az T. Determine the current [8+8]

4. The inner and outer dimensions of a coaxial copper transmission line are 2 and 7 mm respectively. Both conductor have thickness much greater then δThe dielectric is lossless and the operating frequency is 400 MHz. Calculate the resistance per meter langth of the
   (a) Inner conductor
   (b) Outer conductor
   (c) Transmission Line [5+5+6]

5. (a) State and explain Poynting theorem.
   (b) The magnetic field , H of a plane wave has a magnitude of 5 mA/m in a medium defined by $\varepsilon_r = 4, \mu_r = 1$. Determine the average power flow and the maximum energy density in the plane wave. [8+8]

6. (a) Explain the factors on which cut off frequency of a parallel plate wave guide depend.
   (b) Obtain the frequency in terms of cut off frequency fc at which the attenuation constant due to conductor losses for the TMn mode is minimum for a parallel plate wave guide. [8+8]

7. (a) Definite following terms and explain their physical significance.
      i. Attenuation function
      ii. Characteristic impedance
      iii. Phase function, and
      iv. Phase velocity as applied to a transmission line.
   (b) At 8 MHz the characteristic impedance of transmission line is (40-j2) Ω and the propagation constant is (0.01+j0.18) per meter. Find the primary constants. [8+8]

8. (a) An open-wire transmission line having $Z_0 = 650 - 12^0\Omega$ is terminated in Z_0 at the receiving end. If this line is supplied from a source of internal resistance 200Ω, calculate the reflection factor and reflection loss at the sending end terminals.
   (b) A two wire line has a characteristic impedance of 300 Ω and is to feed a 90 Ω resistor at 100 MHz. A Quarter wave line is to be used as a tube, 0.6cm in diameter .Find centre ?to-centre spacing in air? [8+8]

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