[4658] – 563

Seat No.	

T.E. (Electronics and Telecommunication) (Semester – I) Examination, 2014
ELECTROMAGNETICS AND TRANSMISSION LINES
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q.No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8** and Q. No. **9** or Q. No. **10**.*

*2) Figures to **right** indicate full marks.*

*3) Neat diagram must be drawn **wherever** required.*

*4) **Use** of Electronic Pocket Calculator and Smith Chart is **allowed**.*

*5) Assume **suitable** data, if **necessary**.*

1. a) Derive expression for electric field intensity due line charge using Gauss law. **6**

   b) Derive expression for capacitance of parallel plate capacitance. **4**

   OR

2. a) Derive expression for electric field intensity due sheet charge using Gauss law. **6**

   b) Explain polarization in dielectrics. **4**

3. a) Explain the physical significance of Curl. **4**

   b) Given the potential function V = 4x + 2y V in free space, find the stored energy in 1 m^3 volume centered at the origin. **6**

   OR

4. a) Define conduction current and conduction current density and hence derive current Continuity equation. **6**

   b) State and explain Biot and Savart law. **4**

5. a) Write Maxwell's equations for static and time varying fields in point and integral forms. **8**

   b) In the material for which $\sigma = 6$ S/m, $\in_r = 2.5$. The electric field intensity E = 250 Sin (10^{10}t) V/m. Find the conduction and displacement current densities and the frequency at which both have equal magnitudes. **8**

   OR

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6. a) State and Prove Poynting theorem. Interpret each term. **8**

   b) $\mu = 10^{-5}$, $\varepsilon = 4 \times 10^{-9}$, $\sigma = 0$ and $\rho_v = 0$. Find K so that each of the following pairs of fields satisfy Maxwell's equations

      i) $D = 6\hat{a}_x - 2y\hat{a}_y + 2z\hat{a}_z \, nC/m^2$

      $H = kx\hat{a}_x - 10y\hat{a}_y - 25z\hat{a}_z \; A/m$

      ii) $E = (20y - Kt)\hat{a}_x$ and $H = (y + z \times 10^{-6} t)\hat{a}_z$. **8**

7. a) State primary and secondary constants of a transmission line and hence derive relationship between primary and secondary constants of transmission line. **8**

   b) A transmission line has characteristic impedance of 50 ohm. Find the reflection coefficient if line is terminated with
      1) 50 Ohm
      2) 0 Ohm
      3) 75 + j75 Ohm
      4) 75 + j 40 Ohm. **8**

OR

8. a) Explain the phenomenon of reflection on transmission line and reflection coefficient. **8**

   b) Write the equations for voltage and current at any point along the length of transmission line and hence explain physical significance of general solution of transmission line. **8**

9. a) What do you mean by distortion less line ? Derive the expressions for characteristic impedance and propagation constant for distortion less line. **8**

   b) A loss less transmission line with characteristic impedanc 50 ohm is 30 m long and operates at 2 MHz. The line is terminated with a load of (60 + j40). If phase velocity is 0.6 c. where c is speed of light then find using Smith Chart.
      1) Reflection Coefficient
      2) The standing wave ratio
      3) The input impedance. **10**

OR

10. a) Explain what do you understand by standing waves and standing wave voltage ratio and hence derive the expression for input impedance of line in terms of characteristic impedance and propagation constant. **10**

    b) A transmission line operating on 100 MHz has $Z_0 = 60$ ohm, attenuation constant 0.02 Np/m and phase velocity is 0.6 c where c is speed of light in vacuum. Find the line parameters R, L, G and C. **8**
