Code: R7220405 **R7**

B.Tech II Year II Semester (R07) Supplementary Examinations, April/May 2013

EM WAVE AND TRANSMISSION LINES

(Electronics and Communication Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) State and prove Gauss's law. Explain Gauss's law in both integral and differential forms and applications.

(b) Discuss the salient features and limitations of Gauss's law.

2 (a) Define Ampere's force law and establish the associated relations.

(b) Derive an expression for the magnetic field due to a solenoid at any point on its axis. Hence obtain the relation for an infinitely long solenoid case.

3 (a) Explain displacement current and displacement current density.

(b) In a given lossy dielectric medium, conduction current density $J_c = 0.02 \sin 10^9 t$ (A/m^2). Find the displacement current density if $\sigma = 10^3$ s/m and $\varepsilon_r = 6.5$.

4 (a) Explain the wave propagation in good conductors.

(b) A plane wave propagating through the medium with $\varepsilon_r = 8$, $\mu_r = 2$ has $E = 0.5e^{-z/3} \sin(10^8 t - \beta z)\, a_x$ V/m. Determine:
(i) β (ii) wave velocity (iii) loss tangent (iv) intrinsic impedance

5 (a) Explain the surface impedance of good conductor.

(b) What is meant by surface impedance? Explain its importance.

6 (a) Write down the properties on TEM wave.

(b) Write a short notes on: (i) Wave impedances. (ii) Transverse & axial fields.

7 (a) State the important properties of the infinite line.

(b) Derive the relationship between γ, Z_{oc} and Z_{sc}.

(c) A voltage of 45 V is applied to 10 km long field quad cable. The receiving end voltage is 7.868 V and it lags behind by 110.2 V. Calculate the attenuation and phase constants of the cable if it is properly terminated.

8 (a) A line having $Z_o = 50\ \Omega$ is terminated in load impedance $(75 + j75)\ \Omega$. Determine the reflection coefficient and voltage standing wave ratio.

(b) A line with $Z_o = 692 \angle -12^0$ is terminated in 200 Ω resistor. Determine K and S.

*****