

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/m²). Find the displacement current density if $\sigma = 10^3$ s/m and $\epsilon_r = 6.5$.
- 4 (a) Explain the wave propagation in good conductors.
(b) A plane wave propagating through the medium with $\epsilon_r = 8$, $\mu_r = 2$ 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 $Z_0 = 50 \Omega$ is terminated in load impedance $(75 + j75) \Omega$. Determine the reflection coefficient and voltage standing wave ratio.
(b) A line with $Z_0 = 692 \angle -12^\circ$ is terminated in 200 Ω resistor. Determine K and S.
