

R09

Code: 9A10503

B.Tech III Year I Semester (R09) Supplementary Examinations June 2017

ELECTROMAGNETIC THEORY

(Electronics & Instrumentation Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) What is continuity equation? Derive the expression.
(b) State Gauss's law and explain its limitations.
- 2 (a) State Ampere's circuital law. Specify the conditions to be met for determining magnetic field strength H based on Ampere's circuital law.
(b) An infinitely long straight conducting rod of radius 'a' carries a current of I in positive Z direction. Using Ampere's circuital law, find H in all regions and sketch the variation of H as a function of radial distance.
- 3 (a) Derive the boundary conditions for the tangential and normal components of electrostatic fields at the boundary between two perfect dielectrics.
(b) X - Z plane is boundary between two dielectrics. Region $y < 0$ contains dielectric material with $\epsilon_{r1} = 2.5$ while region $y > 0$ has dielectric with $\epsilon_{r2} = 4.0$. If $E = -30ax + 5ay + 70az$ V/m, find normal and tangential components of the E -field on both sides of the boundary.
- 4 (a) A plane wave travelling in positive X -direction in a loss less unbounded medium having permeability 4.5 times that of free space and permittivity twice that of free space. Find the phase velocity of the wave. If the electric field E has only a Y -component with amplitude of 20 V/m, find the amplitude and the direction magnetic field intensity.
(b) For good dielectric, derive the expressions for α , β , v and η .
- 5 (a) Explain the difference between the intrinsic impedance and the surface impedance of a conductor. Show that for a good conductor, the surface impedance is equal to the intrinsic impedance.
(b) State and prove Poynting theorem. Explain its significance.
- 6 (a) Derive the field equations of transverse electric waves in rectangular wave guides.
(b) Describe the non-existence of TEM waves in waveguide.
- 7 (a) Define EMI and explain various sources of EMI.
(b) Explain how electrostatic discharge takes place with practical example.
- 8 (a) What is shielding effectiveness how it is measured?
(b) What are the various grounding techniques for EMC and explain?
