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Reg. No. : .....

Name : .....

Fifth Semester B.Tech. Degree Examination, September 2014

(2008 Scheme) (Special Supplementary)

08.505 : APPLIED ELECTROMAGNETIC THEORY (T)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. What is meant by brewster angle ? What is the significance ?
2. State and prove Poynting theorem.
3. Differentiate between phase velocity and group velocity of an electromagnetic wave.
4. Express the vector $B = \frac{10}{r} a_r + r\cos\theta a_\theta + a_\phi$ in Cartesian co-ordinates.
5. What is skin depth ? Give its equation for good conductors.
6. Explain the principle of quarter wave transformers.
7. Derive the continuity equation.
8. A transmission line of characteristic impedance 50 Ω is terminated with a load of $(100 + j100)\ \Omega$. Find the reflection coefficient and SWR.
9. What are called primary constants of a transmission line ? Define.
10. Derive the wave equation for a lossy dielectric medium. **(10×4=40 Marks)**

PART – B

Answer **any two** questions from **each** Module.

MODULE – I

11. Derive the boundary conditions for electric field.
12. a) Determine D at (4, 0, 3) if there is a point charge -5π mc at (4, 0, 0) and a line charge 3π m c/m along the y-axis.
    b) Derive the expression for magnetic vector potential at a point due to straight current carrying conductor.
13. a) Derive Maxwell's equations from fundamental laws.
    b) Derive the expression for energy stored in electric field.

P.T.O.

MODULE – II

14. Derive the expression for reflection and transmission coefficients when a uniform plane electromagnetic wave is incident obliquely on a dielectric surface with perpendicular polarization.

15. a) A lossy dielectric has an intrinsic impedance of $200 < 30° \Omega$ at a particular frequency. If, at that frequency, the plane wave propagating through the dielectric has the magnetic field component.

$H = 10\, e^{-\alpha x} \cos(\omega t - \frac{1}{2}x)$ ay A/m find E and α. Determine the skin depth and wave polarisation. 7

b) In a lossless medium for which $\eta = 60\pi$, $\mu r = 1$ and $H = -0.1 \cos(\omega t - z)$ ax + 0.5 sin $(\omega t - 2)$ ay A/m calculate εr. 3

16. a) What is meant by uniform transmission lines ? Analyse a uniform transmission line by taking an elemental length and derive voltage and current equations. 7

b) Find the skin depth for cu when an electromagnetic wave is incident normally (Given f = 30 MHz, $\mu r = 1$ and conductivity ($\sigma = 5.8$ mho/m). 3

MODULE – III

17. a) A hollow rectangular waveguide has dimensions 6 cm x 4 cm. The frequency of the impressed signal is 5 GHz. Calculate for TE_{10} mode.

1) The cutoff wavelength
2) The phase constant
3) The guide wavelength
4) The intrinsic wave impedance 8

b) What are the disadvantages of single stub matching ? 2

18. Derive the expression for input impedance, VSWR and reflection coefficient for a transmission line. 10

19. Explain how Smithchart can be used for the design in stub matching. 10