Exam.Code:0928
Sub. Code: 33657

2056

B.E. (Electronics and Communication Engineering)

Fourth Semester

EC-408: Electromagnetic Theory

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use of scientific calculator is allowed.*

x-x-x

1. Attempt the following:-

(a) State Gauss's law in differential form.

(b) Define electric flux density.

(c) What is divergence of a vector field?

(d) Write Laplace's equation.

(e) Define magnetic vector potential.

(f) State Faraday's law of electromagnetic induction.

(g) What is intrinsic impedance?

(h) Define skin depth.

(i) What is VSWR?

(j) Why TEM waves cannot exist in waveguides? (10x1)

UNIT - I

2. (a) Derive Poisson's and Laplace's equations from Gauss's law.

(b) A point charge of 5 μC is located at the origin. Find the electric field intensity at a point(2, −1, 3) m. (2x5)

3. (a) Derive Maxwell's equations in differential form and explain their physical significance.

(b) Given $V = x^2y + yz^2$, find the electric field E and verify whether the field is conservative. (2x5)

4. (a) Explain Poynting theorem and its significance in EM energy flow.

(b) A plane wave in a conductor has $\sigma = 5.8 \times 10^7$ S/m, $\mu = \mu_0$. Find the skin depth at 50 Hz. (2x5)

P.T.O.

UNIT - II

5. (a) A rectangular waveguide with dimensions of 3 cm × 2 cm operates at 10 GHz. Find

(i) Cut-off frequency (fc) (ii) Cut-off wavelength (λc) (iii) Guided wavelength (λg) (iv) Phase constant (βg).

(b) Explain TE and TM modes in rectangular waveguides. (2x5)

6. (a) Find the input impedance of the distortion less transmission line at radio frequencies in both open circuited and short-circuited cases.

(b) Discuss the use of UHF lines as circuit elements. (2x5)

7. (a) Derive the transmission line equations and obtain expressions for characteristic impedance.

(b) A transmission line has: R = 5 Ω/km, L = 2 mH/km, G = 0, C = 0.01 μF/km. Find the characteristic impedance at 1 kHz. (2x5)

x-x-x