

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST 3 EXAMINATIONS – MAY 2018

B.Tech IVth Semester

COURSE CODE: 17B11EC411

MAX. MARKS: 35

COURSE NAME: Electromagnetic Engineering

COURSE CREDITS: 04

MAX. TIME: 2 HRS

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume any missing data.

1. Write the Maxwell's equations for time varying fields in phasor form and in time varying form. Specify the significance of these equations. (3m)

2.

A. Use the Laplace's equation in order to find the capacitance per unit area of two infinite parallel plates separated by a distance of d and filled with a dielectric material of relative dielectric constant ϵ_r . (3m)

B. The electric flux density in medium-1 (for $z < 0$) is given by $D_1 = 20a_x + 30a_y + 50a_z \text{ C/m}^2$. Find E_2 in medium-2 (for $z > 0$) if $\epsilon_{r1} = 2$ and $\epsilon_{r2} = 4$. (2m)

3. A uniform plane wave in free space has electric field intensity $E_s = 10e^{-j\beta x}a_z + j15e^{-j\beta x}a_y \text{ V/m}$. Describe the wave polarization. Find H_s . Determine the time average power density of the wave in W/m^2 . (5m)

4. The phasor magnetic field intensity for a 100MHz uniform plane wave propagating in a certain loss-less material is $(2a_y - j5a_z)e^{-j25x} \text{ A/m}$. Knowing that the maximum amplitude of electric field intensity is 1500V/m, find β , η , λ , v_p and μ_r . (5m)

5. Use the Smith chart to find the L-section impedance matching circuits (two) if the normalized load impedance is given as $0.2 + j0.8$ at an operating frequency of 100MHz. Find the voltage standing wave ratio before the impedance matching and after the impedance matching. (6m)

6. Define distortion-less transmission line. Draw the patterns of voltage and currents on the short circuited transmission line as a function of wavelength towards the generator. (4m)

7. Write briefly about the following. (5m)

A. Stream lines and Flux lines.

D. Properties of perfect electrical conductors.

B. Equation of continuity.

C. Quarter wave transformer.

E. Brewster's angle.