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Question Paper Code: U4402

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Electronics and Communication Engineering

21UEC402– ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

(Regulation 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

- In free space, the Poisson equation becomes CO1- U
 - Maxwell Equation
 - Laplace equation
 - Ampere equation
 - Steady state equation
- Electromagnetic waves are represented in which of the following format? CO1-U
 - Longitudinal waves
 - Transverse waves
 - Sinusoidal waves
 - Surface waves
- Condition for cut off frequency CO1-U
 - $Z_1=0$
 - $Z_1 = -4Z_2$
 - $Z_1 = Z_2$
 - Both (a) and (b)
- A line terminated in its characteristic impedance has no standing waves and thus no nodes is _____ line CO1-U
 - Distorted
 - Transmission
 - Smooth
 - None
- The mode of wave propagation that a parallel plate waveguide can support are CO1-U
 - TEM,TE,TM modes
 - TM,TE modes
 - TEM,TM modes
 - TEM,TE modes

PART – B (5 x 3= 15Marks)

- Write the integral form of ampere circuital law for static and time varying fields. CO1-U
- What is the Difference between displacement current and conduction current? CO1-U

8. A constant k low pass filter has a cut off frequency of 10 kHz. The design impedance is 600 ohms. Find the value of L CO2-App
9. Mention the relation between Z_0 and primary constants. CO1-U
10. A wave is propagated in the dominant mode in a parallel plane waveguide. The frequency is 6 GHz and the plane separation is 4 cm. Calculate the cut-off frequency in the waveguide CO1-U

PART – C (5 x 16= 80Marks)

11. (a) Solve the Laplace equation for the potential field in homogenous region between two coaxial cable with radius a,b and $V=V_0$ at $r=a$ and $V=0$ at $r=b$. Find the capacitance per unit length between them. CO2-App (16)
- Or
- (b) Derive the expression of Maxwell equation for static and time varying Fields for both electrostatic and magneto static fields by applying suitable theorems CO2-App (16)
12. (a) The equation for uniform plane wave travel in free space given in phase form. The electric field is given by $E_y = 10.4e^{j(2\pi*10^9t-\beta x)}$ $\mu\text{V/m}$. CO4- Ana (16)
- (i) Analyze the direction of propagation of uniform plane wave for different parameters
- (ii) Phase velocity
- (iii) Phase constant
- (iv) Propagation constant
- (v) Expression for magnetic field in phasor form
- Or
- (b) A lossy dielectric has $\mu_r=1$, $\epsilon_r=50$ and $\sigma=60$ mho/m at 15.9 MHz. Calculate the attenuation constant, phase constant and Propagation Constant, wavelength, velocity of propagation for uniform plane wave is travelling through that particular medium. CO4- Ana (16)
13. (a) Model the characteristic impedance of T network with Open and short circuit impedance condition CO3- App (16)
- Or
- (b) Design low pass filter having a cut off frequency of 5000Hz and design impedance of 600 ohms. The frequency of infinite attenuation is $1.25f_c$. CO3 -App (16)

14. (a) A 65Ω lossless used at a frequency where wavelength 80 cm terminated by load of $120 + j70 \Omega$. Analyze the reflection coefficient, VSWR and input impedance using smith chart. CO5- Ana (16)
- Or
- (b) Analyze a single stub match for a load of $150 + j225$ ohms for a 75 ohms line at 500 MHz using smith chart. CO5 -Ana (16)
15. (a) Compare the field equations for TE waves between parallel planes. CO6-Ana (16)
- Or
- (b) Determine the solution of electric and magnetic fields of TE waves guided along rectangular waveguide. CO6-Ana (16)

