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Question Paper Code: U4402

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

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)

1. According to Faraday's law, EMF stands for   CO1- U

   (a) Electromagnetic field   (b) Electromagnetic force

   (c) Electromagnetic friction   (d) Electromotive force

2. Electromagnetic waves are produced by   CO1-U

   (a) static charge   (b) accelerated charge

   (c) moving charge   (d) charged particle

3. Condition for cut off frequency   CO1-U

   (a) $Z_1=0$ (b) $Z_1 = -4Z_2$ (c) $Z_1 = Z_2$ (d) Both (a) and (b)

4. The Primary constants of a transmission lines are   CO1-U
   (a) α,β   (b)Z_0, γ (c) R,L,G and C   (d) V,I

5. The mode of wave propagation that a parallel plate waveguide can   CO1-U
   support are
   (a) TEM,TE,TM modes   (b) TM,TE modes   (c) TEM,TM modes   (d) TEM,TE modes

PART – B (5 x 3= 15Marks)

6. Write the point form of Gauss law?   CO1-U

7. What is Brewster angle?   CO1-U

8. A constant k low pass filter has a cut off frequency of 10 kHZ. The design   CO2-App
   impedance is 600 ohms. Find the value of L

9. Give the expression for open circuited and short circuited transmission line   CO1-U

10. Why rectangular waveguides are preferred over circular waveguide?   CO1-U

11. (a) Solve the Laplace equation for the potential field in homogenous region between two concentric conducting spheres with radius a,b and V=V_0 at r=a and V=0 at r=b. Find the capacitance between concentric spheres. CO2-App (16)

Or

(b) Illustrate the Maxwell equation for both integral and point form for time varying field by applying suitable theorem 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 $E_y = 10.4e^{j(2\pi*10^9 t - \beta x)}$ μV/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 μ_r=1, ε_r=50 and σ=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 65 Ω lossless used at a frequency where wavelength 80 cm terminated by load of 120 + j70 Ω. Analyze the reflection co-efficient, VSWR and input impedance using smith chart. CO5- Ana (16)

Or

(b) A 75Ω lossless transmission line is to be matched with a (100-j80)Ω load using single stub. Analyze the stub length and its distance from the load corresponding to the frequency of 30MHz using smith chart. CO5 -Ana (16)

15. (a) Compare the field equations for TE waves between parallel planes.   CO6-Ana   (16)

Or

(b) Classify the field equations for TE waves between parallel planes.   CO6-Ana   (16)

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