C   **Reg. No. :** ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Question Paper Code: U4402

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 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. The product of E and H gives _____ unit   CO1 U

   (a) W/m^2 (b)V/m   (c)A/m   (d)m/A

2. For a perfect dielectric, which parameter will be zero?   CO1U

   (a)Conductivity   (b)Frequency   (c)Permittivity   (d)Permeability

3. When the load impedance is not equal to characteristic impedance of   CO1 U
   transmission line _____ takes place.

   (a) Insertion   (b) Reflection   (c) Both a and b   (d) None of these

4. The Condition for distortion less line is   CO1U

   (a) R/L=G/C   (b) RL=CG   (c) R=G   (d) L=C

5. Single stub matching is applicable for_____frequency   CO1U

   (a) Single   (b) Double   (c) Low   (d) High

PART – B (5 x 3= 15Marks)

6. Write the integral form of ampere circuital law for static and time varying CO1U
   fields.

7. What is the Difference between displacement current and conduction current?   CO1U

8. Mention the advantages of m-derived filter.   CO1U

9. Mention the relation between Z_0 and primary constants.   CO1U

10. A wave is propagated in the dominant mode in a parallel plane waveguide. The   CO4App
frequency is 6 GHz and the plane separation is 4 cm. Calculate the cut-off
frequency in the waveguide

PART – C (5 x 16= 80Marks)

11. (a) Solve the Laplace equation for the potential field in homogenous   CO2App   (16)
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.

Or

(b) If a potential $V=x^2yz+Ay^3z$ CO2App   (16)
i)   Find A so that Laplace equation is satisfied
ii)   With the value of A, Determine electric field at (2,1,-1)

12. (a) Illustrate about the propagation of electromagnetic waves in good   CO4 Ana   (16)
conductor

Or

(b) A 300MHz uniform plane wave is propagating through fresh   CO4 Ana   (16)
water. If amplitude of E-fields is 35V/m and the material is
assumed to be lossless. (for fresh water $\mu_r=1$ and $\varepsilon_r=78$) Analyze
the EM Wave in fresh water,
(i) Attenuation constant   (ii) Phase constant   (iii) wavelength
(iv) Velocity of propagation   (v) Intrinsic impedance   (vi)
Propagation Constant (vii)Amplitude of magnetic field intensity

13. (a) Design a constant k low pass filter with suitable filter sections.   CO3 App   (16)

Or

(b) Derive the   characteristic impedance of T network with Open and   CO3 App   (16)
short circuit impedance condition.

14. (a) A 70 Ω lossless used at a frequency where wavelength 80 cm   CO5 Ana   (16)
terminated by load of 140 + j91 Ω. Analyze the reflection co-
efficient,VSWR and input impedance using smith chart.

Or

(b) Analyze input impedance for a 1.25λ long transmission line at a   CO5 Ana   (16)
sending end with a characteristic impedance $Z_0 = 50\varOmega$ and a load
impedance $Z_0 = 30 + j40\varOmega$ and also find out output admittance at
reflection coefficient using smith chart.

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15. (a) Classify the field equations for TM waves between parallel planes. CO6Ana (16)

Or

(b) Illustrate the expression for the field components of TE waves in CO6Ana (16) rectangular waveguide.

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