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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Telecommunication Engineering **Duration: 3 hrs.**
Course Code: 19ET5PCTLA **Max Marks: 100**
Course: TRANSMISSION LINES AND ANTENNAS **Date: 13.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may suitably be assumed.

UNIT - I

1 a) Draw the following transmission lines: **08**
1. Two wire line
2. Rectangular waveguide
3. Co-axial cable
4. How are these different from conventional lines? Highlight the wavelength, physical length correlation in both of them.

b) Voltage and current at any point on a transmission line are **08**
$V(z)=E_R \text{Cosh}\gamma z + I_R Z_o \text{Sinh}\gamma z$
$I(z)=I_R \text{Cosh}\gamma z + E_R/Z_o \text{Sinh}\gamma z$
Why is it not just constant V=IR and I=V/R? What are α, β and γ?

c) Derive expression for Z_o. **04**

OR

2 a) A generator of 1 volt, 1000Hz supplies power to a 100km transmission line having the following parameters: **10**
R=10.4Ω/km
L=0.00367H/km
$G=0.8 \text{ X } 10^{-6}$ mho/km
C=0.00835**μ**F/km
Find α,, γ and Zo of the transmission line.

b) The characteristic impedance of a certain line is $710\angle 14°\Omega$ and the propagation constant is 0.007+j0.028/km. The line is terminated in a 300Ω resistor. Calculate the input impedance of the line, if its length is 100km. **10**

UNIT - II

3 a) What is skin effect? Give expressions for Inductance and Capacitance of co-axial line. **05**

b) A 50MHz open wire line is to be buit of copper wire of diameter 3.264mm and to have Ro=425Ω. **10**
1. Find the desired spacing 'd'
2. Calculate L and C of 5m of this line, if the line is dissipationless.

c) Show voltage and current on a dissipationless line for **05**
   A. OC
   B. $Z_R \neq R_o$
   C. SC

UNIT - III

4 a) Show expressions for finding the Inductance and Capacitance of Open wire line at higher frequencies? **10**

b) Explain – Wave guides and MMICs. **10**

UNIT - IV

5 a) Define the following Antenna Parameters and expressions for them. **12**
   A. Directivity
   B. Power Gain
   C. Relation between Directivity and Beamwidth

b) What is the maximum power received at a distance of 0.5km over a freespace 1GHz circuit consisting of a transmitting antenna with 25dB gain and a receiving antenna of gain 20dB. The gain is with respect to isotropic source. The transmitting antenna input is 150W. **08**

OR

6 a) Differentiate between Broadside and Endfire Antenna Arrays. Obtain the beamwidths for both for the given case and show their radiation pattern. **12**
   1. Broadside-Power of equal magnitude and in phase $d=\lambda/2, \delta=0$
   2. Endfire -Power of equal magnitude and out of phased $d=\lambda/2, \delta=\Pi$

b) A uniform linear array consists of 16 isotropic point sources with a spacing of $\lambda/4$. If the phase difference is -90˚, Calculate **08**
   A. HPBW
   B. Directivity
   C. Beam Solid Angle
   D. Effective Aperture
   δ=-90˚. The system is extended end fire.

UNIT - V

7 a) A half wave dipole radiating in free space is driven by a current of 0.5 Amp at the terminals. Calculate E and H field one km from the antenna at angles of 45˚ and 90˚. **10**

b) A small circular loop and diameter $\lambda/10$ is spaced $\lambda/20$ from the ground plane. **10**
   A. What is the directivity or gain of the loop alone assuming no losses.
   B. What is the directivity or gain with a ground plane assuming no losses.

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