[5153]-557
T.E. (E & TC)
ANTENNA & WAVE PROPAGATION
(2012 Pattern) (End-Semester) (Semester-II)

Time : 2½ Hours *Max. Marks :70*
Instructions to candidates:
  1) *All questions are compulsory*
  2) *Neat diagrams must be drawn wherever necessary.*
  3) *Figures to the right side indicate full marks.*
  4) *Assume suitable data if necessary.*
  5) *Use of calculator is allowed.*

Q1) a) A uniform plane wave of frequency 5MHz has average poynting vector 1.5W/m². If the medium is lossless with relative permeability $\mu r=2$ and relative permittivity $\epsilon r=3$. Determine velocity of propagation, wavelength, intrinsic impedance of a medium and r.m.s. value of electric field. **[8]**

  b) Explain the following characteristics of wireless channel **[6]**
    i) Coherence band width.
    ii) Coherence time and.
    iii) Fading.

  c) Derive vector potential A for an magnetic current source J. **[6]**

<center>OR</center>

Q2) a) What is polarization of wave? Explain linear and circular polarization of wave. **[6]**

  b) Write a short note on **[6]**
    i) Virtual height.
    ii) Multihope Propagation.

  c) The power radiated by a lossless antenna is 10 watts. The radiation intensity of this antenna is $U = Bo\cos^3\theta$ (W/Sr) $0 \le \theta \le \pi / 2$ $0 \le \Phi \le 2\pi$. Find. **[8]**
    i) The maximum power density in (W/m²) at a distance of 1000 meter (assume for field distance) specify the angle where this occurs.
    ii) Directivity
    iii) Gain of the antenna.

<div align="right">*P.T.O.*</div>

Q3) a) Derive the equation for input impendance and directivity of half wave dipole. **[8]**

b) Show the current distribution on small dipole and derive the equation for its input impedance. **[8]**

OR

Q4) a) Find the radiation efficiency of a single turn and eight -turn small circular loop at f=100MHz. the radius of the loop is $\lambda/25$, the radius of the wire is $10^{-4}\lambda$ and the turns are spaced $4\times10^{-4}\lambda$ apart. Assume the wire is copper with a conductivity of 5.7×10^7 (S/m) and antenna is radiating into free space.(Where ohmic resistance per unit length/ohmic skin effect resistance per unit length=0.38). **[10]**

b) Give the comparison of far fields of small loop and short dipole. **[6]**

Q5) a) For two element array consisting identical radiators carrying equal curents in phase, obtain positions of maxima and minima of the radiation pattern if the distance of separation $d=\lambda$ **[8]**

b) Derive antenna array factor for N-element linear array taking the centre element as reference for N is odd and even.

[8]

OR

Q6) a) Draw and explain the radiation pattern of an endfire array. **[8]**

b) Explain in brief Dolph - Tchbyscheff distribution. What is the need for Tchbyscheff distribution?. **[8]**

Q7) Explain the following antennas with its structural details dimensions, radiation pattern, diagram, specifications, features and applications. **[18]**

    a) Micro strip antenna

    b) Lens antenna.

    c) Biconical antenna

OR

Q8) a) Explain the working of Rhombic antenna in detail. **[8]**

b) With the help of suitable diagram explain the operating principle of **[10]**

    i) Super turnstile

    ii) Slot antenna.

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