[4858] - 1050

T.E. (E & TC)
ANTENNA & WAVE PROPAGATION
(2012 Pattern) (End Sem.)

)Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:
1) *Answers any one Questions out of Q1 & Q2, Q3 & Q4, Q5 & Q6, Q7 & Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume Suitable data if necessary.*

Q1) a) What is poynting vector? What is its significance? Derive an expression for poynting vector? **[6]**

b) Derive the fundamental equation for free space propagation and explain its parameter **[6]**

c) A lossless resonant $\lambda/2$ dipole antenna with input impedance of $73\,\Omega$ is to be connected to a transmission line whose characteristics impedance is $50\,\Omega$. Assuming that the pattern of the antenna is given approximately by $U = B_0 \sin^3 \theta$. Find the overall maximum gain of this antenna. **[8]**

OR

Q2) a) State Maxwell's field equation with their significane and derive the wave equation foe lossless dielectric medium. **[6]**

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

c) Explain the following wireless channel characteristics **[8]**

i) Coherence bandwidth

ii) Coherence time

Q3) Find the following terms for half wave Dipole: **[18]**

    a)   Specify the current

    b)   Vector magnetic potential

    c)   Far field components of Electric & Magnetic fields

    d)   radiation density, radiation intensity

    e)   radiated power, radiation resistance

    f)   Directivity

    g)   draws the radiation pattern

<div align="center">OR</div>

Q4) a)   Calculate the radiation resistance of a double turn and an eight turn small circular loop when radius of loop is $\lambda/10$ and the medium is free space. Calculate its efficiency if loss resistance is $25\,\Omega$ **[6]**

    b)   Derive the expression for radiation resistance of Infinitesimaldipole. **[6]**

    c)   Derive the expression for input impedance of small dipole. **[6]**

Q5) a)   Write a short notes on **[8]**

        i)   Pattern Multiplication

        ii)   Binomial Array

    b)   An Endfire array with element spaced at $\lambda/2$ and with axes of elements at right angles to the line of array is required to have directivity of 36. Determine - the array length and the width of major lobe. **[8]**

<div align="center">OR</div>

Q6) a)   Design a broad side Dolph - Tschebhysheff array of five elements with half wavelength spacing between elements and with major to minor lobe ratio to be 19dB. Find the excitation coefficients & array factor. **[6]**

    b)   Give the comparison of broadside and End fire antenna array. **[5]**

    c)   Explain planar array. State its advantages and applications. **[5]**

Q7) a) What is Microstrip patch antenna? Give structure details, radiation pattern, specification and application of such antenna. **[5]**

b) What is meant by Rhombic Antenna? How it is constructed? Explain how unidirectional pattern is obtained in properly terminated Rhombic Antenna. **[5]**

c) Write a short notes on following antennas with respect to structural details, radiation pattern, features and applications **[6]**

   i) Hertz antenna

   ii) Whip antenna

<div align="center">OR</div>

Q8) a) Write a short notes on the following antennas **[12]**

   i) Lens Antenna

   ii) Resonant Antenna

   iii) Super - turnstile Antenna

b) A paraboloidal reflector antenna with diameter 20m is designed to operate at frequency of 6 GHz and illumination efficiency of 0.54. Calculate the antenna gain in decibels. **[4]**