

Total No. of Questions : 8]

SEAT No. :

**P2862**

**[4958]-1050**

[Total No. of Pages :3

**T.E.(E&TC)**

**ANTENNA & WAVE PROPAGATION**  
**(2012 Pattern)(Semester-II) (End Sem.)**

*Time :2½Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Answer any one Question 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? [8]
- b) Derive vector potential A for an magnetic current source J. [6]
- c) Calculate the skip distance for flat earth with MUF of 10MHz.If wave is reflected from a height of 300 Km where maximum value of refractive index(n) is 0.9. [6]

OR

- Q2)** a) Explain antenna radiation mechanism in detail. [6]
- b) What is polarization of wave? Explain the polarization of three types of wave with the help of relevant diagram? [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  $U=B\sin^3\theta$  . Fnd the overall maximum gain of this antenna . [8]

- Q3)** a) Find the following terms for small Dipole antenna: [18]
- i) Specify the current
  - ii) Vector magnetic potential
  - iii) Far field components of Electric & Magnetic fields
  - iv) Radiation density, radiation intensity
  - v) Radiated power, radiation resistance
  - vi) Directivity
  - vii) Draws the radiation pattern.

OR

**P.T.O.**

- 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  $25\Omega$ . [8]
- b) Derive mathematical expression for power density and radiation intensity of half wave dipole antenna and draw radiation pattern of half wave dipole antenna in E and H plane. [10]

- Q5)** a) Write a short notes on [8]
- Pattern Multiplication
  - Binomial Array
- b) For an array of four isotropic sources along Z-axis separated by a distance  $\lambda/2$  and progressive phase shift  $\alpha = 0$  find [8]
- Nulls direction
  - Direction of maxima
  - Direction side lobes
  - Half power Beam width
  - Draw neat radiation pattern.

OR

- Q6)** a) Explain planar array. State its advantages and applications. [6]
- b) Design a broad side Dolph-Tschebyscheff 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. [5]
- c) Give the comparison of broadside and End fire antenna array. [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]
- Hertz antenna
  - Whip antenna

OR

**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]**

