(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3089   Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

B. Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2010-11

ANTENNA & WAVE PROPAGATION

Time : 3 Hours   *Total Marks : 100*

Note : Attempt **all** the questions.

1.   Answer any **four** parts :   **(5×4=20)**

   (a)   Show that the directivity of an electric current element is 3/2.

   (b)   An Antenna has an effective height of 100 meters and the current at the base is 450 Amperes (rms) at 40,000 Hz. What is the power radiated ?

   (c)   A transmitting antenna having an effective height of 61.4 metres, takes a current of 50 Amp (rms) at a wavelength of 625 metres. Find :

   (i)   Radiation resistance of the antenna

   (ii)   Power radiated.

   (d)   Explain the terms :

   (i)   Radiation Resistance

   (ii)   Effective Area.

   (e)   Explain the terms :

   (i)   Directivity of an Antenna

   (ii)   Gain of an Antenna .

   (f)   Explain Reciprocity theorem and Antenna beam width.

2. Answer any **two** parts : (10×2=20)

 (a) Design a four element broadside array of λ/2 spacing between elements. The pattern is to be optimum with a side lobe level 19.1 db down the main lobe maximum.

 (b) What is broadside array ? Deduce an expression for the radiation pattern of a broadside array with n vertical dipoles. Plot the radiation pattern in (i) vertical, (ii) horizontal planes for such an array with four dipoles.

 (c) Drive an expression for an array of n sources of equal amplitude and spacing (End-fire case).

3. Answer any **two** parts : (10×2=20)

 (a) Briefly describe the composition of the ionosphere. Prove that the refractive index of a layer of the ionosphere is given by :

$$n = \sqrt{1 - \frac{81N}{F^2}}$$

 where N = ionic density.

 (b) Write an essay on 'ground wave propagation' and show that is affected by the terrain and the earth's curvature.

 (c) What are the different layers of the ionosphere ? Describe their properties and explain how they are vary diurnally and seasonally.

4. Answer any **two** parts : (10×2=20)

 (a) Describe the current distribution and radiation pattern of a Folded dipole antenna. Find the input impedance of a folded dipole and explain why the antenna has a higher bandwidth.

(b) Derive an expression for the gain of a paraboloidal antenna. Explain how a paraboloidal antenna gives a highly directional pattern. What are the practical application of such an antenna ?

(c) Describe the construction and basic principles of operation of a helical antenna under :

    (i) Normal mode of operation

    (ii) Axial mode of operation.

    What are its applications ?

5. Write short notes on any two :   **(10×2=20)**

    (i) Radiation pattern measurement

    (ii) Gain measurement

    (iii) Impedance measurement.