

(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 $\lambda/2$ 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 it 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 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.