

B.E. (ETC) Examination, 2012
Part-III 6th Semester

Sub : ANTENNA ENGINEERING (ET 605)

Full Marks – 70.

Time – 3 Hrs.

The questions are of equal value and Answer any FIVE questions.

Answer should be brief and to the point.

1. What do you mean by antenna? With proper diagram explain the current distribution on a thin wire antenna for different length with respect to wave length. For the given pattern $\sin 2\theta$ find out the value of Directivity in dB. Suppose an antenna has $D = 4$, $R_{\text{rad}} = 40 \Omega$ and $R_{\text{diss}} = 10 \Omega$. Find antenna efficiency and maximum power gain.

[4+4+2+4]

2. Write Friis transmission formula. A 50W transmitter at 900 MHz is radiating into free space using a linearly polarized 12dBi Omnidirectional antenna, Calculate the power density and the electric field intensity at a distance of 10 km from the antenna along the direction of the main beam. Define Antenna far and near field zones.

[5+5+4]

3. Define antenna Polarization. A right circularly polarized antenna has $(a\theta - ja\phi) / \sqrt{2}$ Calculate the polarization efficiency of the antenna if the incident electric field is right circularly polarized and the linearly polarized in the θ direction. What is meant by isotropic radiation and omnidirectional radiation?

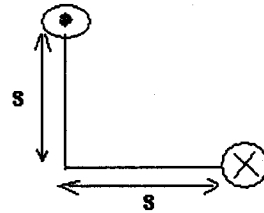
[4+6+4]

4. Derive an expression for the resultant field of an array of N isotropic source and obtain the condition for operating it as i) Broad side array ii) End fire array
Explain the concept of principle of pattern multiplication with an example.
What do you mean by Grating lobes? What are the conditions for eliminating Grating lobes for Broad side array?

[8+2+4]

5. What do you mean by Binomial array? Design a 5-element Dolph-Chebyshev array with $d = 0.5\lambda$ and sidelobes which are 20 dB below the main beam.

Two identical antennas shown in figure are placed in the $\theta=90^\circ$ plane, the elements have equal amplitude excitation with 180° polarity difference, find out the normalized electric field strength.



[4+6+4]

6. With proper diagram explain the principle of Microstrip antenna. Mention different feeding mechanism for Microstrip antenna. Explain how the size and bandwidth of the antenna depends on substrate height and thickness. Write down the disadvantages of Microstrip antenna.

[4+4+4+2]

7. Define the following antenna terminologies. i) Effective Aperture ii) Effective height, Determine the directivity and radiation resistance of a small dipole Antenna. Derive an expression for the field components of a small loop starting with expressions of vector magnetic potential.

[4+4+6]

8. Write notes on, the following terms (any two):

[7 × 2]

- Phased array antenna
- Loop antenna
- Yagi Uda array
- Discone and Helical antenna