

FACULTY OF ENGINEERING
B.E. 3/4 (ECE) II Sem. (Main) Examination, May/June 2012
ANTENNAS AND PROPAGATION

Time : 3 Hours]

[Max. Marks :75

Note : Answer all questions from Part A. Answer any five questions from Part B.

PART – A

(Marks : 25)

1. Define the effective aperture of an antenna. 3
2. Differential between Near field and Far field. 2
3. Draw the horizontal and vertical radiation patterns of a Half Wave dipole placed along z axis. 2
4. What are the applications of a loop antenna ? 2
5. Define the critical frequency with respect to sky wave propagation. 2
6. Given the heights of transmitting and receiving antennas as 225 m and 100 m respectively, what is the maximum distance over which space wave propagation is possible ? 3
7. What is the Lorentz gauge condition ? 2
8. The incoming solar radiation at a place on the surface of the earth is 1.2 kW/m². What is the amplitude of the electric field corresponding to the incident power ? 3
9. In a broadside array of 20 isotropic radiators, equally spaced at a distance of $\lambda/2$ determine the beam width between first nulls. 3
10. A radio wave is incident on a layer of ionosphere at an angle of 30 degrees with the vertical. If the critical frequency is 1.2 MHz. What is the maximum usable frequency ? 3



PART – B

(Marks : 50)

11. Derive expressions for the electric and magnetic fields of an alternating current element. Define the radiation induction and the electrostatic terms. 10
12. With a neat sketch explain the working principle of a Helical antenna. What are the various modes under which a Helical antenna can be operated? 10
13. a) A uniform linear array consists of 12 isotropic in-phase point sources spaced $\lambda/2$ apart. Calculate :
i) HPBW
ii) Beam solid angle
iii) Directivity
iv) Effective Area 5
- b) Radiation Intensity of a particular antenna is given by $\Phi = \Phi_m \sin^2 \theta$. Determine the directivity of the antenna. 5
14. a) Describe how gain of the antenna can be measured using the Three antenna method. 5
- b) In the measurement of the gain using three antenna method, three Horn antennas A, B and C are measured in pairs at 12 GHz. The separation of antennas is 8 m. The transmitted power is +3 dBm. The received powers are -31 dBm, -36 dBm and -28 dBm for antenna pairs AB, AC and BC respectively. Find the gains of the antennas. 5
15. Briefly discuss about the formation of ionosphere and describe how the radio waves can be propagated using the ionosphere. Derive expression for the relative refractive index of the ionosphere. 10
16. Explain the working principle of the following antennas : 10
- a) Parabolic Reflector antenna
- b) Horn antenna
17. Write short notes on the following : 10
- a) Effects of earth on vertical patterns
- b) Duct Propagation.