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Sixth Semester B.E. Degree Examination, June 2012
Antenna and Propagation

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. State and explain: Aperture efficiency, effective height and bandwidth of an antenna. (09 Marks)
- b. Show that the directivity of an antenna is the ratio of the area of a sphere to the beam area. (05 Marks)
- c. Derive Friis transmission formula. (06 Marks)
- 2 a. The radial component of the radiated power density of an infinitesimal linear dipole of length $l \ll \lambda$ is given by $\frac{a_r A_m \sin^2 \theta}{r^2}$ where A_m = peak value of the power density, a_r = radial unit vector. Find the directivity of the antenna. (06 Marks)
- b. Prove that directivity for a source with unidirectional pattern of $U_m \cos^n \theta$ (where n is any number) can be expressed as $D = 2(n + 1)$. (06 Marks)
- c. Obtain the field pattern for two point sources situated symmetrically with respect to the origin. Two sources are fed with equal amplitude and equal phase signals. Assume: Distance between two sources = $\lambda/2$. (08 Marks)
- 3 a. Derive an expression for electric field component of a linear antenna of length $\lambda/2$ long. (12 Marks)
- b. Derive the expression for radiation resistance of a short dipole with uniform current. (08 Marks)
- 4 Write notes on:
 - a. Pattern multiplication. (07 Marks)
 - b. Power distribution in broad side array. (06 Marks)
 - c. Radiation pattern. (07 Marks)

PART – B

- 5 a. Derive the expression for E field component of a small circular loop antenna of radius 'a', carrying current I. (12 Marks)
- b. State and illustrate Babinet's principle. (08 Marks)
- 6 Write short notes on:
 - a. Lens antenna. (07 Marks)
 - b. Log-periodic antenna. (07 Marks)
 - c. Antennas for ground penetrating radar. (06 Marks)
- 7 a. What is meant by diffraction of radio waves? Define knife edge diffraction gain. (07 Marks)
- b. Describe ground wave propagation. (07 Marks)
- c. Obtain the expression for line of sight distance between the transmit and receiver antennas. (06 Marks)
- 8 a. Discuss the reflection mechanism where by electromagnetic waves are bent back by a layer of the ionosphere. Include in your discussion a description of the virtual height of a layer. (12 Marks)
- b. Describe briefly the strata of the ionosphere and their effects on sky wave propagation. (08 Marks)