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B. Tech  
PEEC 5401

Seventh Semester Examination – 2007

ANTENNA ENGINEERING

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory  
and any **five** from the rest.

The figures in the right-hand margin  
indicate marks.

1. Explain the following questions : 2×10
- (a) Why is a Hertzian dipole referred to as an electric dipole ?
  - (b) What is an omni directional antenna ?
  - (c) What are the traits of a uniform linear array ?

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- (d) What is the significance of pattern multiplication ?
- (e) What is meant by the effective area of an antenna ?
- (f) What is an optimum horn ?
- (g) How the desired phase angle difference is achieved for a log-periodic antenna ?
- (h) How the reactive components of the antenna impedance indicate the nature of resonance existing in the antenna ?
- (i) What are the functions of the non-resonant elements of a Yagi-Uda array ?
- (j) What is axial ratio pattern ?

2. Determine the directivity of an antenna whose normalized intensity is given by

(a)  $U(\theta, \varphi) = \sin\theta \sin^2\varphi$  where,  $0 \leq \theta \leq \pi$ ,  
 $0 \leq \varphi \leq \pi$

(b)  $U(\theta, \varphi) = \sin^2\theta \sin\varphi$  where,  $0 \leq \theta \leq \pi$ ,  
 $0 \leq \varphi \leq \pi$

5+5

3. A horizontal infinitesimal electric dipole of current  $I_0$  is placed symmetrically about the origin and directed along the y-axis. Derive the (a) far-zone fields radiated by the dipole and (b) directivity of the antenna. 10
4. What is a folded dipole ? Explain the characteristics of the folded dipole and show that the input impedance of a two element folded dipole of  $l = \lambda/2$  is four times greater than that of an isolated element of the same length. 10
5. Explain the complementary behavior between a slot and dipole antennas. 10
6. Explain the principle of working of paraboloid type antennas. Show that maximum gain of a paraboloid antenna using uniformly illuminated reflector is  $6.5 (D/\lambda)^2$ , where the symbols have their usual meanings. Give the frequency range of its use. 10

7. Explain the basic characteristics of a rectangular patch antenna. Write the feed arrangements used for micro strip antenna. 10

8. Write short notes on any two: 5x2

(a) Pyramidal horn

(b) Broadside and End-fire array patterns

(c) Electronic scanning antenna.

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