

B.E/B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, Nov./Dec. 2012

ELECTRONICS AND COMMUNICATION ENGINEERING – VI SEM

EC9354 – ANTENNA AND WAVE PROPAGATION 50

(REGULATION 2008)

Time: 3 hour

Max. Mark : 100

Answer All Questions

**Part – A (10 x 2 = 20 Marks)**

1. An antenna has a field pattern given by  $E(\theta) = \cos \theta \cos 2\theta$  for  $0^\circ \leq \theta \leq 90^\circ$ . Find HPBW, FNBW & draw the pattern.
2. What is the role of a folded dipole in yagi array. What is the value of its input impedance.
3. Determine the length  $L$  and flare angles  $\theta_H$  and  $\theta_E$  of pyramidal horn. E-plane aperture is  $5\lambda$ . The horn is fed by a rectangular WG with TE<sub>10</sub> mode. Let  $\delta=0.2\lambda$  in the E-plane and  $0.375\lambda$  in the H-plane.
4. What is the purpose of feeding mechanism in a parabolic reflector antenna?
5. A uniform linear array is required to produce an end-fire beam when it is operated at a frequency of 7 GHz. It contains 50 radiators and is spaced at  $0.5\lambda$ . Find the progressive phase shift required to produce the end-fire beam. Find the beamwidth between first null.
6. Define Huygen's theorem and Love's equivalence principle.
7. A circular loop antenna has a diameter of  $5\lambda$ . Find its directivity and radiation resistance.
8. What is an anechoic chamber?
9. A pulse of a given frequency transmitted upward is received back after a period of 10ms. Find the virtual height of the reflecting layer.
10. Define substandard refraction.

**Part – B (5 x 16 = 80 Marks)**

11.a.(i) Explain the directional characteristics of horizontal and vertical field component of half wave dipole antenna. (8)

(ii) Explain with relevant diagrams, the various types of baluns used for exciting the center-fed dipoles. (8)

12.a.(i) Derive the design equations of horn antenna. (8)

(ii) Explain the geometry of Cassegrain feed. Mention its advantages. (8)

(OR)

12.b.(i) Explain the radiation mechanism of a slot antenna and show that it is a dual of dipole antenna. (8)

(ii) Explain different types of feeding system of parabolic reflector antenna. (8)

13.a.(i) With block diagram explain the principle of a two element adaptive array. (8)

(ii) Write the mathematical substantiation of binomial array. (8)

(OR)

13.b.(i) Derive the expression for array factor for N element uniform linear array. (10)

(ii) Calculate HPBW and directivity of 15 elements for binomial array with spacing of  $\lambda/2$  between elements. (8)

14.a.(i) Explain the working of EBG structure and its application. (16)

(OR)

14.b.(i) Discuss the slotted cylinder antennas in details. (8)

(ii) In a log periodic dipole array, describe the relationship between apex angle, scale constant and spacing. (8)

15.a.(i) Explain the role of effective dielectric constant of an ionized gas. (8)

(ii) Discuss the atmospheric ducts in details. (8)

(OR)

15.b.(i) Derive the expression for refractive index and critical frequency of ionosphere layer. (16)