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**Question Paper Code : 31226**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2012.

Sixth Semester

Electronics and Communication Engineering

EC 1352 A — ANTENNAS AND WAVE PROPAGATION

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Compare directivity and gain.
2. Give an example for pattern multiplication.
3. Define magnetic vector potential.
4. Write the relation between dipole antenna and assumed current distribution.
5. Draw the helical geometry.
6. When does the travelling wave become standing wave?
7. How can aperture blockage be avoided?
8. Write the expression for F-number of lens antenna.
9. Find the electron density of the layer if the critical frequency of an ionised layer is 1.5 MHz.
10. List the effects of earth curvature on space wave propagation.

PART B — (5 × 16 = 80 marks)

11. (a) (i) A lossless resonant  $\lambda/2$  dipole antenna with input impedance of  $73\Omega$  is connected to line of  $50\Omega$  characteristic impedance. Assuming that the pattern of antenna is given by  $u = B_0 \sin^3 \theta$ . Find the overall maximum gain of the antenna. (10)
- (ii) The radiation intensity of an antenna is given by  $u = A_0 \sin \theta$ . Find the directivity as a function of the directional angles. (6)

Or

- (b) Derive an expression for field strength of an N element uniform linear array and draw the variation of E as a function of total phase difference. Show that the first side lobe ratio for a uniform linear array is  $-13.5$  dB. (16)
12. (a) Obtain an expression for field and power radiated by a current element and derive the expression for its radiation resistance. (16)

Or

- (b) (i) Prove that the radiation resistance of  $\lambda/2$  dipole antenna is  $73\Omega$ . (8)
- (ii) Explain the relation between a current element and electric dipole. (8)
13. (a) Explain the need for three elements in Yagi array and the relation between apex angle, scale constant and spacing in log periodic array. (16)

Or

- (b) Compare resonant and non-resonant antennas and explain the constructional details of Rhombic antenna. (16)
14. (a) Explain the radiation mechanism of slot antenna and the geometry of Cassegrain feed. (16)

Or

- (b) (i) Derive the design equations of EM horn. (8)
- (ii) A rectangular aperture with a constant field distribution with  $a = 3\lambda$  and  $b = 2\lambda$  is mounted on an infinite, ground plane. Compute, in the E-plane, HPBW, BWFN, FSLBW and FSLMM. (8)
15. (a) Explain the characteristics of ionospheric layers and the mechanism of ionospheric propagation. (16)

Or

- (b) Explain the role of dielectric constant of ionized gas and briefly discuss the atmospheric ducts. (16)