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Question Paper Code : 30957

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Sixth Semester

Electronics and Communication Engineering

EC 2353 — ANTENNAS AND WAVE PROPAGATION

(Regulation 2008)

(Common to PTEC 2353 – Antennas and Wave propagation for B.E. (Part –Time)
Fifth Semester – Electronics and Communication Engineering – Regulation 2009)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. If the radiation resistance of an antenna is 65 ohms and loss resistance is 10 ohms, find its efficiency?
2. Define Half Power Beam Width.
3. A uniform linear array contains 50 isotropic radiation with an inter element spacing of $\lambda/2$. Find the directivity of broadside forms of arrays.
4. What is pattern multiplication and draw the pattern of 2 point sources separated by $\lambda/2$?
5. The impedance of an infinitesimally thin $\lambda/2$ antenna ($L = 0.5 \lambda$ and $L/D = \infty$) is $73 + j42.5 \Omega$. Calculate the terminal impedance of an infinitesimally thin $\lambda/2$ slot antenna.
6. Draw the geometry for E-plane type of metal-plate lens antenna.
7. What are the applications of microstrip antenna?
8. Differentiate near and far field.
9. What is free space loss factor?
10. What is Gyro Frequency?

PART B — (5 × 16 = 80 marks)

11. (a) Define and explain in detail the terms “Radiation Resistance”, “gain”, “directivity”, “effective aperture” and “polarization” of an antenna. (16)

Or

- (b) Derive the electric and magnetic field components of Hertzian dipole. (16)

12. (a) Derive the field quantities and draw radiation pattern for a half wavelength dipole.

Or

- (b) Two identical radiators are spaced $d = 3\lambda/4$ meters apart and fed with currents of equal magnitude but with 180° phase difference. Evaluate the resultant radiation identify the direction of maximum and minimum radiation.

13. (a) (i) Explain the Image theory and its application in detail. (8)

- (ii) Explain the construction and principle of pyramidal horn antenna. A pyramidal horn antenna having aperture dimensions of $a = 5.2$ cm and $b = 3.8$ cm is used at a frequency of 10 GHz. Calculate its gain and half power beam widths. (8)

Or

- (b) (i) Discuss the various feed techniques for Rectangular patch antenna with neat diagrams. (8)

- (ii) Find the diameter of a dish antenna that will form a beam having 0.5 deg, Half Power Beam Width (HPBW) at a frequency of 8.2 GHz. Assuming an efficiency constant of 0.6, calculate the antenna gain and effective aperture. (8)

14. (a) (i) With a suitable diagram, depict the construction and operation of a Yagi antenna. (8)

- (ii) With a neat sketch design a quad-helix earth station antenna. Calculate the directivity and the effective aperture. (8)

Or

- (b) (i) Elaborate on Log-Periodic Antenna with a neat sketch. (10)

- (ii) Design a Log-Periodic dipole array with 7 dBi gain and a 4 to 1 bandwidth. Specify apex angle α , scale constant k and the number of elements. (6)

15. (a) (i) Describe the Troposcatter propagation. (8)
(ii) Explain the effect of Earth's magnetic field on ground wave propagation. (8)

Or

- (b) Describe the theory of propagation of Electromagnetic wave through the ionosphere in the presence of external magnetic field and show that the medium acts as doubly refracting crystal.
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