Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20422

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Sixth Semester

Electronics and Communication Engineering

EC 6602 – ANTENNA WAVE PROPAGATION

(Regulations 2013)

(Also common to : PTEC 6602 – Antenna Wave Propagation for B.E. (Part – Time) Fifth Semester Electronics and Communication Engineering Regulations – 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Calculate the radiation resistance of a $\lambda/10$ wire dipole in free space.

2. The radiation resistance of an antenna is $72\,\Omega$ and loss resistance is $8\,\Omega$. What is the directivity in dB if the power gain is 16?

3. State Babinet's principle applied to slot antennas.

4. Draw the diagram representing rectangular microstrip antenna. List the substrates used for microstrips antenna.

5. What is binomial array? What are the disadvantages of binomial array?

6. What is meant by uniform linear array?

7. Write Friss transmission formula and define the parameters in it.

8. What are near and far field measurements?

9. Two points on earth are 1500 km apart and are to communicate by means of HF. For a single hop transmission, the critical frequency is 7 MHz. Calculate maximum usable frequency for those two points, if the height of the ionosphere layer is 300 km.

10. What do you mean by fading?

PART B — (5 × 13 = 65 marks)

11. (a) (i) A 1.83 m paraboloid reflector is to be used at 6 GHz. Calculate the beamwidth between the first nulls. Also calculate the gain of the antenna and express it in decibels. (6)

(ii) Define the term "directivity gain. Derive the relation between the gain of an antenna and the antenna aperture. (7)

Or

(b) Write short notes on (i) reciprocity theorem (ii) Beam solid angle (iii) Front to back ratio (iv) self impedance of an antenna (v) half power beam width (vi) polarization (vii) directivity (viii) principal patterns.

12. (a) (i) Find the dimensions and terminal resistance of a complementary slot for a cylindrical dipole with length to diameter ratio of 28 and length of 0.925λ having terminal impedance of 710 + j0 ohms. (5)

(ii) Explain in detail about radiation mechanism of slot antenna and derive the impedance of a Infinitesimally thin $\lambda/2$ slot antenna. What are the differences between slot and its complementary antenna. (8)

Or

(b) (i) Write short notes on microstrip antenna. List the advantages and disdvantages of microstrip antenna. Discuss the ways to improve the bandwidth of microstrip antenna. (10)

(ii) Explain the different feeding techniques for micostrip antenna. (3)

13. (a) Derive the field equations for array of two point sources with spacing $\lambda/2$ with equal amplitude and phase. Also derive the array factor, direction of maximum, minimum and half power point directions. Draw the radiation pattern.

Or

(b) (i) Discuss the properties of linear broadside array. (7)

(ii) A linear broadside array consists of four equal isotropic inphase point sources with $\lambda/3$ b spacing (overall length of the array = λ). Calculate the directivity, BWFN, HPBW. (6)

14. (a) Describe how the radiation pattern and gain of a given antenna can be measured experimentally. (13)

Or

(b) Discuss about (i) electronic bandgap structures and its applications (ii) Helical antenna under axial and normal mode of operation. (13)

15. (a) Explain briefly the terms skip distance, maximum usable frequency and virtual height as used in ionospheric propagation.

Or

(b) Write short notes on: (i) Tropospheric propagation (ii) Troposcatter propagation (iii) Ground wave propagation and its advantages, disadvantages.

PART C — (1 × 15 = 15 marks)

16. (a) Using reciprocity principle, show that the radiation pattern of an antenna is same in both transmit and receive mode.

Or

(b) Discuss about modern antennas and their applications.