## Question Paper Code : 91456

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Sixth Semester

Electronics and Communication Engineering

EC 6602 – ANTENNA AND WAVE PROPAGATION

(Regulations 2013)

(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. A radio link has a 20W transmitter connected to an antenna of 2.5m² effective aperture at 5GHz. The receiving antenna has an effective aperture of 0.5m² and is located at a 15km line of sight distance from the transmitting antenna. Assuming lossless, matched antennas, find the power delivered to the receiver.

2. Draw the field lines of radiation from $\lambda/2$ dipole antenna.

3. Draw various types of Horn antenna.

4. Define Babinet's principle.

5. Find the minimum element spacing of a 10 element linear uniform broadside array of isotropic radiators to achieve 7dB directivity.

6. What is Binomial array ?

7. Define Reconfigurable antenna and Active antenna.

8. List the advantages of dielectric antenna.

9. Two points on the earth are 1500km apart and are to communicate by means of HF. For a single hop transmission, the critical frequency at that time is 10 MHz. Calculate the MUF for those two points if the height of the ionospheric layer is 300 km.

10. Define skip distance.

PART – B                 **(5×13=65 Marks)**

11. a) i) With neat diagram, explain about Yagi-Uda antenna.                 (7)

   ii) An antenna has a field pattern given by $E(\theta) = \cos\theta \cos2\theta$ for $0° \leq \theta \leq 90°$. Find Half Power Beam Width (HPBW) and Beam Width Between First Nulls (FNBW).                 (6)

(OR)

   b) Explain in detail about fields of short dipole and derive the expression for its impedance of free space.

12. a) i) Compare uniform and tapered aperture antennas. Give examples.                 (3)

   ii) With neat diagram, explain parabolic reflector antenna and its Cassegrain feeding system.                 (10)

(OR)

   b) i) Explain the radiation mechanism of Microstrip antenna.                 (6)

   ii) Write short notes on Slot antennas.                 (7)

13. a) i) What are broadside and end-fire array ?                 (3)

   ii) Derive the expressions for field pattern and array factor of n isotropic point sources of Broad side array.                 (10)

(OR)

   b) Briefly explain the following antenna arrays.
      i) Phased Arrays.                 (6)
      ii) Adaptive Arrays.                 (7)

14. a) i) Explain about helical antenna and its modes of operation. Derive the expressions for pitch angle.                 (8)

   ii) A 10 turn helix is constructed at 8GHz with a circumference of 3.45 cm and a pitch angle of 15°. Find the HPBW and gain.                 (5)

(OR)

   b) Describe the experiment set up for the measurement of the following :
      i) Radiation pattern.                 (6)
      ii) VSWR.                 (7)

15. a) Write short notes on :
      i) Ground wave propagation.                 (4)
      ii) Duct propagation.                 (4)
      iii) Troposcatter propagation.                 (5)

(OR)

   b) Explain how earth's magnetic field affects the propagation of radio waves in the ionosphere. Discuss its effects on Refractive index and absorption of radio waves.

PART – C                 **(1×15=15 Marks)**

16. a) i) What is Log periodic antenna ? Explain the design principle of Log periodic antenna.                 (9)

   ii) Design a 50 – 200 MHz Log-periodic antenna to obtain a gain corresponds to scale factor 0.8 and space factor 0.15.                 (6)

(OR)

   b) Explain with the aid of a diagram, how multi-path transmission can arise of a long distance high frequency point to point service ? What steps can be taken to minimize the effects of multi-path transmission ? Explain how the D-layer and sporadic E layer affect long distance radio communication.                 (15)