Code No: 07A5EC08 **R07** **Set No. 2**

III B.Tech I Semester Examinations,November 2010
ANTENNAS AND WAVE PROPAGATION
Common to Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Determine the height of the transmitting antenna to obtain a maximum distance of transmission up to 38km from a 24meter high receiving antenna?
   (b) What is the effect of the curvature of earths surface on the propagation of microwave signal in a line of sight link? [8+8]
2. Briefly describe the following terms connected with sky-wave propagation: virtual height, critical frequency, maximum usable frequency, skip distance and fading.[16]
3. (a) Show that the radiation resistance of a half wave dipole is 73 Ω.
   (b) With suitable representation show the equality of effective length at transmitter and receiver. [8+8]
4. (a) Draw the radiation patterns of resonant and non-resonant antennas.
   (b) Draw the structure of inverted V antenna and explain its working principle. [8+8]
5. (a) What is the major drawback of lens antenna, restricting their use to the highest frequencies?
   (b) What is meant by zoning? [8+8]
6. (a) A transmitter is fed with 100KW of power and produces the same field strength at a given point as a $\lambda/2$ dipole fed with 200KW of power. Calculate the gain of the aerial
      i. relative to $\lambda/2$ dipole
      ii. relative to an isotropic aerial.
   (b) An elementary doublet is 10cm long. If the 1MHz current flowing through it is 2A, what is the field strength 20km away from the doublet, in a direction of maximum radiation? [8+8]
7. Explain why an antenna using a paraboloid reflector is likely to be a highly directive receiving antenna? [16]
8. (a) Derive the field components and draw the field pattern for two point source with spacing of $\lambda/2$ and fed with currents of equal magnitude but out of phase by 180^0.

(b) Calculate the directions of the maxima and the nulls of the array factor of an array of two infinitesimal dipoles oriented along the z-direction, kept at

$$z_1 = -0.125\lambda \; and \; z_2 = 0.125\lambda$$

and carrying currents $I_1 = e^{j\pi/4}$ and $I_2 = e^{-j\pi/4}$, respectively. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A5EC08 **R07** **Set No. 4**

III B.Tech I Semester Examinations,November 2010
ANTENNAS AND WAVE PROPAGATION
Common to Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. For what applications wideband antennas are required? List the various broadband antennas, giving typical percentage bandwidths for each? [16]

2. Define maximum usable frequency and derive an expression for the same in the case of a thin ionosphere layer over a plane earth. [16]

3. (a) Derive the expression for total far field for the two point sources with currents of unequal magnitudes and with same phase.
   (b) Derive the field components and draw the field pattern for two point source with spacing of $\lambda/2$ and fed with currents of equal magnitude and phase. [8+8]

4. (a) What is Hertzian dipole? Write the relation between a current element and an electric dipole write suitable expressions.
   (b) Show that the radiation field at the surface of the earth from a $\lambda/4$ monopole is given by $E = \frac{6.14}{r}\sqrt{W}mV/m$ [8+8]

5. Explain end fire mode helical antenna with suitable sketches, explain its working and find its field components and also write applications of helical antenna. [16]

6. (a) An antenna of jam aircraft is being used to jam enemy radar, if the antenna has a gain of 12dB in the direction of transmission and the radiated power is 5kW, calculate the electric field intensity in the vicinity of enemy radar which is 3km away, The frequency of transmission is 4 GHz
   (b) The electric field of an antenna is given by $E = a_\theta \frac{\sin(4\pi\cos\theta)}{4\pi\cos\theta}$ Calculate
      i. the direction of the maximum radiation
      ii. the 3dB beam width,
      iii. the direction and level of the first side lobe and
      iv. the number of nulls in the pattern.

   [8+8]

7. With sketches describe two methods of feeding a paraboloid reflector in which the primary antenna is located at the focal point. Under what conditions this method of feed is unsatisfactory? [16]

8. A communication link is to be established between the two stations using half wave lenght antenna for maximum directive gain .Transmitter power is 1KW,frequency of

operation is 100MHz. and distance between transmitter and receiver is 100Km.what is the maximum power received by the receiver.Explain and derive the formulas used? [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A5EC08 **R07** **Set No. 1**

III B.Tech I Semester Examinations,November 2010
ANTENNAS AND WAVE PROPAGATION
Common to Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss the advantages and disadvantages of a travelling wave antenna
   (b) Sketch the radiation pattern of a helical antenna. [8+8]
2. (a) What are the three important characteristics of UHF and microwave antennas?
   (b) Explain the geometry of the parabolidal reflectors? [8+8]
3. (a) Draw the radiation pattern of an dipole Antenna and explain all its characteristics?
   (b) What is the maximum effective aperture area for a beam antenna having half-power widths of 30^0 and 25^0 in perpendicular planes intersecting in the beam axis? Assume that minor lobes are small and can be neglected. [8+8]
4. (a) Draw the neat setup for measuring gain of an antenna?
   (b) What is meant by zoning? Differentiate curved surface zoning and plane surface zoning of lens antenna [8+8]
5. Explain the effect of the following on tropospheric wave propagation?
   (a) radius of curvature of path
   (b) Earths radius
   (c) Earths curvature. [16]
6. (a) What is refraction? Explain under what circumstances it occurs and what causes it?
   (b) Determine the maximum usable frequency for a critical frequency of 20MHz and an angle of incidence of 35^0. [8+8]
7. (a) Compare the Loop antenna with Short Dipole.
   (b) A lossless quarter wave monopole antenna is situated above a perfectly conducting ground plane and is driven from 300 MHz source with the amplitude of 100V. Calculate the average power radiated if the antenna impedance is (36.5+j21.2) Ω and internal resistance of source is 50Ω. [8+8]
8. (a) A six element receiving aerial array consists of a horizontal line of vertical dipoles equally spaced by 2.5m, the outputs of which are added in phase. What are the significant properties of the pattern. Describe the directional characteristic of this array at 400MHz and 40MHz.

(b) Derive Hansen-Woodyard condition for N element end fire array for enhancing its directivity. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A5EC08 **R07** **Set No. 3**

III B.Tech I Semester Examinations,November 2010
ANTENNAS AND WAVE PROPAGATION
Common to Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Determine the fields at any far point P for an array of n elements with equal spacing and currents equal in magnitude and phase.
   (b) What is end fire array? Derive expressions for the radiation pattern for an end fire array of 'N' identical elements. [8+8]
2. Discuss the phenomenon of ground wave propagation at long and medium waves. Show that this gives one of the most reliable methods of radio communications.[16]
3. (a) Define antenna radiation pattern. Draw and explain its parameters.
   (b) Calculate the radiation efficiency of an antenna if the input power is 2kW, maximum directivity is 22dB, and the radiated power density at a distance of 10km in the direction of the maximum directivity is 0.2mW/m^2. [8+8]
4. (a) What is meant by resonant antenna and non resonant antenna, explain with suitable examples?
   (b) Design a Rhombic antenna using Maximum Relative Field Intensity design method. [8+8]
5. (a) Explain the concept of retarded scalar and vector potentials.
   (b) Derive the expression for radiation field of a small loop antenna of radius 'a' at the centre of the co-ordinate system. [8+8]
6. (a) Calculate the 3dB beam width and power gain of a parabolic antenna at a frequency of 1.6GHz with 2.4 meter diameter and 48% antenna efficiency?
   (b) With neat diagram explain the geometry of the parabolic reflector? [8+8]
7. (a) Write short notes on Duct propagation?
   (b) Determine the fade margin for the following conditions: distance between sites D=40Km, frequency f=1.8GHz smooth terrain, humid climate and reliably objective 99.99%. [8+8]
8. (a) Discuss the design characteristics of pyramidal and sectorial horns?
   (b) With neat sketch explain how gain measurement is carried out using direct comparison method? [8+8]

⋆ ⋆ ⋆ ⋆ ⋆