Code No: R05310403 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2007
ANTENNAS AND WAVE PROPAGATION
(Common to Electronics & Communication Engineering and Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Draw the Dual characteristics of an antenna.
   (b) Explain the Radiation from Two wire. [8+8]
2. (a) Derive the expressions for electric field in case of short current element and hence obtain the conditions for the field to be in Franhofer region.
   (b) Find the distance from a radiating element with 60Hz current such that radiation and induction fields are equal. [10+6]
3. (a) A linear broadside array consist of 4 identical equal in phase point source with $\lambda/3$ spacing. Calculate and plot the field pattern. Also find the directivity and beam width.
   (b) What is optimum spacing used in parasitic array? Why. [12+4]
4. (a) Write short notes on "Helical Antenna".
   (b) Derive an expression for radiated electric field strength of a traveling wave radiation of length 'l'. [8+8]
5. (a) Sketch the current distribution of folded dipole and find out input impedance when two legs have unequal diameters.
   (b) A Parabolic dish provides a power gain of 50dB at 10GHz, with 70% efficiency. Find out
      i. HPBW.
      ii. BWFN, diameter. [8+8]
6. (a) Describe the method of measuring the gain and radiation pattern of an antenna.
   (b) A standard gain horn antenna with a power gain of 12.5, is used to measure the gain of a large directional antenna by comparison method. The test antenna is connected to the receiver and an attenuator adjusted to 23dB in order to have the same receiver output. Find out the gain of the large antenna. [8+8]
7. (a) Describe the following:
      i. Space wave propagation.
      ii. Duct propagation.

(b) VHF communication is to be established with a 50watt transmitter at 100MHz. Calculate the LOS distance if the heights of transmitting and receiving antennas are respectively 50m and 10m. Assuming the capture area of the transmitting antenna is 25sqmts, calculate the field strength at the receiving neglecting ground reflected wave. [8+8]

8. (a) Discuss the characteristics of F_1 and F_2 layers.

(b) Discuss the reasons for reduction of field strength in sky wave propagation. [8+8]

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Code No: R05310403 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2007
ANTENNAS AND WAVE PROPAGATION
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between Directive Gain and Power Gain.
   (b) An antenna has a radiation resistance of 73 ohms and a lossy resistance of 7 ohms. If the power gain is 20, calculate the directivity and the efficiency of the antenna. [8+8]
2. (a) Derive an expression for radiance resistance of current element starting from the expression for radiation fields.
   (b) Prove that the impedance of an isolated antenna when used for receiving is same as when used for transmitting. [8+8]
3. (a) In order to scan the beam of a linear array to 30^0 off broadside. Calculate the inner element phase shift required if the elements are spaced at 3 cms and the frequency is 64 KHz.
   (b) What are linear arrays. Compare Broadside array and End fire array. [8+8]
4. (a) Derive an expression for electric field of a Non Resonant antenna of length 'l' carrying current.
   (b) Sketch and explain the constructional features of a Helical Antenna. [10+6]
5. (a) What is a Parasitic Element? Describe the use of different types of parasites in TV receiving antennas.
   (b) Derive an expression for aperture field distribution of a parabolidal reflector. [8+8]
6. (a) Describe the method of measuring the gain and radiation pattern of an antenna.
   (b) A standard gain horn antenna with a power gain of 12.5, is used to measure the gain of a large directional antenna by comparison method. The test antenna is connected to the receiver and an attenuator adjusted to 23dB in order to have the same receiver output. Find out the gain of the large antenna. [8+8]
7. (a) Define MUF and Critical frequency. Derive the expressions for the same. What is Secant law?
   (b) Describe the Ground wave propagation. [8+8]
8. (a) Derive the field strength of tropospheric wave.

(b) Give an account of effect of earths imperfections and roughness. [8+8]

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Code No: R05310403 **Set No. 3**

III B.Tech I Semester Regular Examinations, November 2007
ANTENNAS AND WAVE PROPAGATION
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the terms:
   i. Beam Width
   ii. Side Lobe Level
   iii. Polarization
   iv. Effective Aperture Area.
   (b) What is the effective length of an antenna. Determine the effective length of a half wave dipole antenna. [8+8]
2. (a) Show that the radiation resistance of a small loop is equal to $320\pi\ 4(A/\lambda^2)$ ohms where A is loop area.
   (b) What is Folded Dipole ? Find its Radiation Resistance. [8+8]
3. (a) Explain the procedure for measuring the radiation pattern of a half wave dipole.
   (b) What is the requirement for tapering of arrays.
   (c) State the applications of arrays. [8+4+4]
4. (a) State the advantages and disadvantages of Rhombic Antenna.
   (b) Draw the radiation pattern for traveling wave antenna for L=$\lambda/2$,λ,2 λ,4λ and 8 λ. [8+8]
5. (a) What is a Parasitic Element? Describe the use of different types of parasites in TV receiving antennas.
   (b) Derive an expression for aperture field distribution of a parabolidal reflector. [8+8]
6. (a) Describe the method of measuring the gain and radiation pattern of an antenna.
   (b) A standard gain horn antenna with a power gain of 12.5, is used to measure the gain of a large directional antenna by comparison method. The test antenna is connected to the receiver and an attenuator adjusted to 23dB in order to have the same receiver output. Find out the gain of the large antenna. [8+8]
7. It is defined to establish short wave communication between two points on earths surface(assumed flat) separated by 1200km. Calculate MUF and angle of take off

of the transmitted wave from the following: Highest signal frequency returned to earth after vertically upward propagation=7.2MHz. Virtual height of the ionized layer=200kms. Deduce the working formula. [16]

8. (a) Distinguish between Radio and Optical horizons. Give the reasons.
   (b) Write short notes on M-Curves. [8+8]

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Code No: R05310403 **Set No. 4**

III B.Tech I Semester Regular Examinations, November 2007
ANTENNAS AND WAVE PROPAGATION
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define antenna beam width and directivity and obtain the relation between them.
   (b) Calculate the electric field (Erms) due to an isotropic radiator radiating 3KW power at a distance of 2 Km from it. [8+8]

2. (a) State the following antenna theorems and bring out their importance in antenna measurements :
      i. Reciprocity theorem.
      ii. Maximum power transfer theorem.
   (b) A half wave transmitting antenna radiates 10KW of power at 100MHz.If the heights of transmitting and receiving antennas are 100m and 9m, calculate the power received at a distance of 10kms from the transmitting antenna. [8+8]

3. (a) Calculate
      i. HPBW
      ii. Solid Angle if a linear array having 10 isotropic point source with $\lambda/2$ spacing and phase difference δ=90^0.
   (b) Write short notes on Hansen-Wood yard end fire array. [8+8]

4. (a) Distinguish between Traveling wave and Standing wave antennas.
   (b) Compare Resonant and Non Resonant antennas.
   (c) Explain the working of Rhombic antenna. [4+4+8]

5. (a) Compute the gain, principle beam width and HPBW of a 10m diameter parabolic dish with a half wave length dipole feed in focus at 10GHz.
   (b) Explain the Cassegrain mechanism in transmission mode. List out the advantages and disadvantages of Cassegrain feed. [8+8]

6. (a) What is an electromagnetic horn antenna? What are its applications? The length of an E-plane sectoral horn is 15cms. Design the horn dimensions such that it is optimum at 10GHz.
   (b) Calculate the minimum distance required to measure the field pattern of an antenna of diameter 2m at a frequency of 3GHz. Derive the necessary equation. [8+8]

7. (a) Show that Ionosphere act as a variable refractive index medium.
   (b) A radio link has to be established between two earth station at a distance of 25000kms. If the height of ionosphere is 200kms and its critical frequency is 5MHz. Calculate the MUF for the given path. Also calculate the electron density in the ionosphere layer. [8+8]

8. (a) Describe the troposphere and explain how tropospheric ducts can be used for microwave propagation.
   (b) Derive the expression for space wave electric field produced by an antenna at a distance point, assuming a flat earth. [8+8]

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