Code No: V3118 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, May 2013

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

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) An antenna has a radiation resistance of 63Ω and a lossy resistance of 6Ω. If the power gain is 30, calculate the directivity and efficiency of the antenna. [8+8]

2. (a) Obtain the expression for potential fields due to sinusoidally varying sources and explain the significance of the Lorentz guage condition.
   (b) What is short magnetic dipole? How is it realized? [8+8]

3. (a) A linear Broad-side array consists of four equal in-phase point sources with λ/3 spacing. Calculate and plot the field pattern. Also find the directivity and beam width.
   (b) Explain the principle of pattern multiplication with a relevant examples. [8+8]

4. (a) Explain the construction of V-antenna and its principle of working.
   (b) Discuss the design considerations for monofilar helical antenna in axial mode.

5. (a) What is Yagi-Uda antenna? Explain its construction and properties with special reference to the directivity, bandwidth and impedance.
   (b) Describe cassegrain feed mechanism for a parabolic reflector. [8+8]

6. (a) What is optimum horn? Sketch and Explain its characteristics.
   (b) Explain the concept of Zoning and specify the tolerances of zoned and un-zoned non-metallic dielectric lens antennas. [8+8]

7. (a) Explain the characteristics of ground wave propagation.
   (b) List the effects of D-layer in the sky wave propagation. [8+8]

8. (a) Write short notes on tropospheric scattering.
   (b) A radio link has to be established between two earth stations placed at a distance of 25000 km between them. If the height of the ionosphere is 200km and its critical frequency is 5MHz,Calculate the MUF for the given path .Also calculate the electron density in the ionosphere layer. [8+8]

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Code No: V3118 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, May 2013

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Define effective length. Prove that the effective length of the transmitting and the receiving antenna are equal.
(b) A communication link has to be established between two stations using half wavelength antenna for maximum directive gain. Transmitter power is 1KW, distance between transmitter and the receiver is 100 Km, what is the maximum power received by the receiver if the frequency of the operation is 100MHz. [8+8]

2. (a) Define and explain retarded potentials.
(b) A magnetic field strength of 5μA/m is required at a point on $\theta = \pi/2$; 2Km away from an antenna in free space. Neglecting ohmic loss, how much power must the antenna transmit if it is (i) Hertzian dipole of length $\lambda/25$?
(ii) a half wave dipole? [8+8]

3. (a) Derive the Hansen-woodyard condition for the N-element end-fire array for enhancing its directivity.
(b) Distinguish between binomial and uniform linear arrays. [10+6]

4. (a) Explain the significance of helical antennas and discuss its basic properties.
(b) Discuss the design considerations for monofilar helical antennas. [8+8]

5. (a) With neat diagrams, describe the principle of working of 3-element Yagi antenna, listing out its length and spacing requirements.
(b) With neat diagram, explain the geometry of parabolic reflector. [7+9]

6. (a) What is Fermat's principle? How is it applicable to horn antenna? Obtain an expression for the directivity of a pyramidal horn in terms of aperture dimensions.
(b) Obtain the relative field intensity of the dielectric lens antenna. [8+8]

7. (a) Explain "Tropospheric scattering" phenomenon.
(b) Write short notes on
(i) D layer (ii) Sporadic E-layer. [8+8]

8. (a) Explain the phenomena of duct propagation.
(b) Define maximum usable frequency and skip distance. Show that the skip distance for the flat earth at a given frequency is $D_{skip} = 2h\sqrt{(f_{MUF}/fc)^2 - 1}$ [8+8]

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Code No: V3118 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, May 2013

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a)What is the resolution of an antenna? Prove that the directivity is equal to number of point sources in the sky that the antenna can resolve.
   (b) State the reciprocity theorem for antennas. Prove that the self impedance of an antenna in transmitting and receiving mode is same. [8+8]

2. (a) Derive an expression for a radiated electric field for half wave dipole and sketch field strength pattern.
   (b) An electric field strength 10μv/m is to be measured at an observation point $\theta = \pi/2$, 500Km from a half wave dipole antenna operating in air at 50MHz.
   (i) What is the length of dipole?
   (ii)Calculate the current that must be fed to the antenna.
   (iii) Find the average power radiated by the antenna. [8+8]

3. (a) Compare Broad-side and End-fire arrays.
   (b) Find the radiation pattern of four isotropic elements fed in phase, spaced $\lambda/2$ apart by using pattern multiplication. [8+8]

4. (a) Sketch and explain the constructional features of a helical antenna.
   (b) Determine the length L, H-plane aperture and flare angles θ_E and θ_H of a pyramidal horn for which E-plane aperture $a_E = 10\lambda$. The horn is fed by a rectangular wave guide with TE_{10} mode. Let $\delta = 0.2\lambda$ in the E- plane and 0.375λ in the H- plane .Also calculate beam width and directivity. [8+8]

5. With reference to paraboloids , explain
   a) f/d ratio b) Spill over and aperture efficiency
   c) Front to back ratio d) Types of feeds [16]

6. (a) Explain the design characteristics of pyramidal horn.
   (b)What is the importance of Zoning? Explain the tolerances allowed in non-metallic dielectric lens antennas. [8+8]

7. (a) Explain the principle of operation of terrestrial line-of-sight communication.
   (b) Show that the field strength due to the space wave is given by $E = 2Eo \sin[2\pi h_t h_r/\lambda d]$ [8+8]

8. (a) What is meant by the term fading? Explain in brief different types of fading.
   (b) Discuss the characteristics of F1 and F2 layers. [8+8]

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Code No: V3118 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, May 2013

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) State the following theorems and prove them with respect to antennas.
   (i) Reciprocity theorem (ii) Maximum power transfer theorem.
   (b) Evaluate the directivity of
   (i) An isotropic source (ii) Source with bidirectional cosθ power pattern. [8+8]

2. (a) What are Lorentz –guage conditions? Derive the wave equations for scalar and vector potentials using maxwell's approach.
   (b) If the maximum current in the antenna is 20A, find the field intensity at a distance of 2Kms along the axis perpendicular and at an angle 30^o from the antenna.(Assume that the antenna is quarter wave monopole) [8+8]

3. (a) Derive the expressions for the field components of two element array and draw field pattern (i) when $d = \lambda/2$ and $\alpha = 0$ (ii) when $d = \lambda/2$ and $\alpha = 180^o$.
   (b)What is the requirement for the tapering of arrays? Explain [10+6]

4. (a) Explain the basic concept of travelling wave radiators.
   (b) Discuss the design relation of Rhombic Antennas. Mention the advantages of Rhombic Antennas. [8+8]

5. (a) Explain the working of Yagi-Uda antenna.
   (b) Describe the cassegrain feed mechanism of a parabolic reflector. [8+8]

6. (a) Describe how gain of an antenna under test can be measured using absolute gain method.
   (b) With the neat diagram, explain the geometry of parabolic reflector. [8+8]

7. (a) List the effects of D-layer in the sky wave propagation.
   (b) Define MUF and critical frequency. Derive the expressions for the same. What is secant law? [7+9]

8. (a) Explain M-curves and their characteristics.
   (b) Derive the fundamental equation for free space propagation. [8+8]

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