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

III B.Tech. I Semester Supplementary Examinations, December - 2013
ANTENNAS AND WAVE PROPAGATION
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1 (a) The radial component of radiated power density of an infinitesimal dipole of length $l << \lambda$ is given by $W_{av} = \hat{\mathbf{a}}_r A_o \sin^2\theta / r^2$ Watt/m^2, where A_0 is peak power density. Determine the maximum directivity of the antenna and express it as a function of the directional angles θ and ϕ.
(b) Explain in detail the terms beam efficiency and directivity. Use relevant expression and diagrams.

2 (a) Draw the geometry of a short dipole and obtain the expressions for radiated fields for general and far-field cases.
(b) Discuss the geometry of circular loop and obtain its directivity.

3 (a) Considering an array of two isotropic point sources of same amplitude and phase, derive the expression for total electric field at a large distance.
(b) Derive the expression of principal minima and minor lobes for the case of broadside array.
(c) Write the salient features of end-fire array.

4 (a) Discuss the geometry and radiation characteristics of rhombic antenna . Also write the design equations.
(b) Design a10 turn helical antenna so that at the center frequency of 10GHz, the circumference of each turn is 0.95λ. Assuming a pitch angle of 13^0, determine the mode in which the antenna operates, half-power beam width, directivity.

5 (a) Design a Yagi-Uda array having six elements to operate at 100 MHz with a folded dipole feed. What are the lengths of reflector, directors and driven elements? What is the spacing between directors, spacing between reflector and driven element? What is the bandwidth and gain?
(b) Discuss the features and characteristics of flatsheet reflector.
(c) What is spillover with reference to parabolic reflectors? Explain the remedial measures to reduce spill over.

6 (a) Explain radiation pattern measurement in detail.
(b) Present the classification of horn antennas and discuss the characteristics of each type. Also write the design considerations of pyramidal horns.

7 Explain in detail different ionospheric abnormalities.

8 (a) Explain super refraction in detail.
(b) Discuss the effect of earths curvature on tropospheric propagation.

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

III B.Tech. I Semester Supplementary Examinations, December - 2013
ANTENNAS AND WAVE PROPAGATION
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1 (a) An antenna has a field pattern given by $E(\theta) = \cos\theta \cos 2\theta$ for $0^o \leq \theta \leq 90^o$. Find the half -power beamwidth and the beam width between first nulls.
b) Discuss in detail the field regions surrounding an antenna.

2 (a) Derive the expression for radiation resistance of $\lambda/2$ antenna.
(b) Discuss in detail reciprocity for radiation patterns.
(c) Compare far fields of small loop and dipole.

3 (a) Considering an array of two isotropic point sources of same amplitude and opposite phase derive the expression for total electric field at a large distance.
(b) Derive the expression of principal minima and minor lobes for the case of broadside array.
(c) Write the characteristics of binomial array.

4 Discuss the geometry and properties of helical antenna. Also present the radiation characteristics and design considerations in normal and axial modes.

5 (a) Design a Yagi-Uda array having five elements to operate at 500 MHz with a folded dipole feed. What are the lengths of reflector, directors and driven elements? What is the spacing between directors, spacing between reflector and driven element? What is the bandwidth and gain?
(b) Explain the geometry and radiation characteristics of different corner reflector antennas. Also write the design considerations.

6 (a) Explain the measurement of gain by direct comparision method.
(b) Draw the geometry of H-plane sectoral horn, describe its radiational characteristics.
(c) Explain the principle of operation of lens antenna.

7 (a) Explain ionospheric absorption.
(b) Explain the mechanism of radio wave bending by the ionosphere and also explain the concept of critical frequency.
(c) What are SIDs and explain the reasons for causing them.

8 (a)Write the salient features of space wave propagation.
(b) Explain the concept of radio horizon.
(c) Derive the expression for range of space wave propagation.

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

III B.Tech. I Semester Supplementary Examinations, December - 2013

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communication Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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1 (a) An antenna has a field pattern given by $E(\theta) = \cos^2\theta$ for $0^o \le \theta \le 90^o$. Find the beam area of the pattern.
(b) Explain in detail the terms effective height and aperture efficiency. Use relevant expressions and diagrams.

2 (a) Derive the expression for radiation resistance of a short electric dipole.
(b) Derive the expressions for fields for a small loop.

3 (a) Considering an array of two isotropic point sources of same amplitude and in-phase quadrature derive the expression for total electric field at a large distance.
(b) Derive the expression for electric field strength of broadside array with n elements.
(c) Explain the principle of pattern multiplication with an example.

4 (a) write the characteristics of travelling wave antennas. Discuss the geometry and radiation characteristics of long wire antenna.
(b) Design a helical antenna with a directivity of 15 dB that is operating in the axial mode and whose polarization is nearly circular. The spacing between the turns is $\lambda/10$. Determine the number of turns, axial ratio, directivity and progressive phase shift between the turns.

5 (a) Design a Yagi-Uda array having seven elements to operate at 300 MHz with folded dipole feed. What are the lengths of reflector, directors and driven elements? What is the spacing between directors, spacing between reflector and driven element? What is the bandwidth and gain?
(b) Explain aperture blocking and explain the remedial measures if any?
(c) Explain different feed mechanisms for a parabolic reflector and write the advantages and disadvantages of each mechanism.

6 (a) Explain the two-antenna method and three-antenna method of absolute gain measurement.
(b) Draw the geometry of E-plane sectoral horn, describe its radiational characteristics.
(c) Explain the characteristics of dielectric lens antenna.

7 (a) Explain the terms skip distance, Maximum usable frequency, Virtual height.
(b) Explain the characteristics of ground wave propagation and titling of wave fronts in ground wave propagation. Mention its applications in communication.

8 (a) Explain tropospheric scattering in detail.
(b) Explain refraction of radio wave in troposphere and show that radius of curvature of wave path is a function of rate of change of refractive index.

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

III B.Tech. I Semester Supplementary Examinations, December - 2013
ANTENNAS AND WAVE PROPAGATION
(Electronics and Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1 (a) The normalized field pattern of an antenna is given by $E_n = \sin\theta \sin\phi$ for $0 \le \theta \le \Pi$, $0 \le \phi \le \Pi$ and zero elsewhere .Given θ is zenith angle measured from z- axis and ϕ is azimuth angle measured from x-axis . Find the exact and approximate directivities.
(b) Explain the current distribution on lossless two wire transmission line, flared transmission line and linear dipole. Also discuss current distributions on linear dipoles of lengths $l << \lambda$, $l = \lambda/2$, $\lambda/2 < l < \lambda$ *and* $\lambda < l < 3\lambda/2$.

2 (a) Derive the expression for radiation resistance of small loop.
(b) Discuss the fields in Fraunhofer and Fresnel regions for a small dipole.

3 (a) Considering an array of two isotropic point sources of same amplitude and any phase difference derive the expression for total electric field at a large distance.
(b) Derive the expression for electric field strength of end-fire array with n elements.
(c) Write the salient features of broadside array.

4 (a) Discuss the geometry and radiation characteristics of unidirectional and bidirectional V antennas. Also discuss terminated V antennas. Write the polynomials for optimum included angles and maximum directivities.
(b) Design an end-fire right-hand circularly polarized helix having a half-power beam width of 45^o,pitch angle 14^0 and a circumference of 60 cm at a frequency of 500MHz. Determine the turns needed, directivity and axial ratio.

5 (a) Design a Yagi-Uda array having five elements to operate at 200 MHz with a folded dipole feed. What are the lengths of reflector, directors and driven elements? What is the spacing between directors, spacing between reflector and driven element? What is the bandwidth and gain?
(b) Calculate the BWFN and the power gain of a parabolic dish with a diameter of 30m operating at 3 GHz.
(c) Explain the geometry and characteristics of a parabolic reflector.

6 (a) Explain in detail the procedure for measurement of directivity of an antenna.
(b) Write the applications of lens antennas.
(c) Draw the geometry of pyramidal horn, describe its radiational characteristics.

7 (a) Explain the structure of ionosphere and characteristics of different ionospheric layers.
(b) Explain the terms critical frequency and maximum usable frequency.

8 (a) Derive the expression for field strength of tropospheric wave.
(b) Write notes on effective earth radius.

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