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QUESTION BANK (DESCRIPTIVE)

Subject with Code : AWP(16EC418) **Course & Branch**: B.Tech – ECE

Year &Sem: III-B.Tech& I-Sem **Regulation:** R16

UNIT I

Antenna Basics & Dipole antennas

1. Explain the following
   (a) Effective Aperture & Types of Apertures. [L3][CO1][6M]
   (b) Polarization & Types of Polarization. [L3][CO1][4M]
2. (a) Explain Antenna Beam Width and Directivity [L3][CO1][5M]
   (b)Write short notes on Radiation Pattern and Beam Efficiency. [L3][CO1][6M]
3. Explain the following
   (a)Beam Area and radiation intensity [L3][CO1][5M]
   (b)Effective Height of Antenna and Antenna Temperature [L3][CO1][5M]
4. Explain the following
   (a)Front to Back Ratio and Antenna Theorem [L3][CO1][5M]
   (b)Retardation Potential and Basic Maxwell Equation [L3][CO1][5M]
5. Derive expression for Electric and Magnetic Field radiated by Hertzian Dipole and Sketch its Field Strength pattern. [L2&L4][CO1][10M]
6. Derive the expression for radiation resistance and Directivity of Hertzian Dipole [L2&L4][CO1][10M]
7. Derive expression for Electric and Magnetic Field radiated by Half Wave Dipole and Sketch its Field Strength pattern. [L2&L4][CO1][10M]
8. Derive the expression for radiation resistance and Directivity of $\frac{\lambda}{2}$ Dipole [L2&L4][CO1][10M]
9. (a)An Antenna has a $E(\theta)=\cos\theta\cos2\theta$ for $0^O \leq \theta \leq 90^O$. Find HPBW and FNBW. [L4][CO1][5M]
   (b) Find the efficiency of antenna if radiation resistance is 72Ω and loss resistance is 8Ω [L4][CO1][5M]
10. The radiation efficiency of a certain antenna is 95%. The maximum radiation intensity is 0.5 W/Sr. Calculate the directivity of the antenna if (i) P_{input}=0.4 W (ii) P_{rad}=0.3W [L2&L4][CO1][10M]
11. (a)What is meant by radiation pattern? [L1][CO4][2M]
    (b) Find the length of half wave dipole at 30MHz. [L1][CO4][2M]
    (c) What is meant by front to back ratio? [L1][CO4][2M]
    (d) What are the field zones? [L1][CO4][2M]
    (e) What are the different types of aperture? [L1][CO4][2M]

UNIT II
VHF, UHF and Microwave Antennas – I

1. (a) Discuss directivity of small and large loop. [L1][CO4][5M]
   (b) Compare fields of small loop and short dipole. [L1][CO4][5M]
2. (a) Explain about the construction and characteristics of helical antenna. [L1][CO4][5M]
   (b) Discuss about the horn antenna types & its characteristics. [L1][CO4][5M]
3. (a) Explain about construction and operation of Yagi-Uda antenna. [L1][CO4][5M]
   (b) What are the practical design considerations for Monofilarhelical antenna in normal mode? [L1][CO4][5M]
4. (a)Discuss about the helical antenna geometry, axial mode of radiation and its applications. [L1][CO4][5M]
   (b) Discuss the design considerations of pyramidal horn antenna. [L1][CO4][5M]
5. (a) Discuss the types of horn antennas. [L1][CO4][5M]
   (b) What are parasitic elements &where they are used? [L1][CO4][5M]
6. (a) Derive the expression for radiation resistance of small loop antenna. [L1][CO4][5M]
   (b) Write short notes on [L1][CO4][5M]
   i) Folded dipole antenna ii) Yagi-Uda array iii) Horn antenna
7. (a) Give the applications of helical antennas. [L1][CO4][5M]
   (b) Discuss the types of horn antennas. [L1][CO4][5M]
8. Design Yagi-Uda antenna of six elements to provide a gain of 12db if the operating frequency is 200 MHz [L1][CO4][10M]
9. Design 10 turns helix to operate in axial mode for optimum design,
   a) Determine the circumference (λ_0), pitch angle (in degrees) Separation between turns (λ_0)
   b) Determine the Relative wave velocity (free space) Along the wire of helix for ordinary end- fire design, Hansen-wood yard end –fire design
   c) Find Half power beam width of the main lobe (in decrease)
   d) Find the axial ratio (in decibels) [L1][CO4][10M]
10. (a) What are Electrically Small loop antennas? [L1][CO4][2M]
    (b) List out the uses of loop antenna? [L1][CO4][2M]
    (c) Give an expression of radiation resistance of a small loop. [L1][CO4][2M]
    (d) Define axial ratio. [L1][CO4][2M]
    (e) Calculate the power gain of an optimum horn antenna approximately with a square aperture of 10λ on a side. [L1][CO4][2M]
    (f) Calculate the directivity (dB) of 20 turns, having $\alpha=12^O$ Circumference equal to wavelength of helical Antenna [L1][CO4][2M]

UNIT III
VHF, UHF and Microwave Antennas – II

1. (a) Give the advantages and limitations of micro strip antennas. [L1][CO4][5M]
   (b) Explain about micro strip antennas with neat diagrams. [L1][CO4][5M]
2. (a) Write short notes on flat sheet & corner reflector. [L1][CO4][5M]
   (b) What is reflector? What are the types of reflectors? Explain the features of parabolic reflectors. [L1][CO4][5M]
3. (a) Discuss the construction of rectangular patch antenna. [L1][CO4][5M]
   (b) What are the different parameters effects the characteristics of micro strip antenna explain? [L1][CO4][5M]
4. (a) Explain about flat sheet, corner &paraboloidal reflectors. [L1][CO4][5M]
   (b) Discuss the application of image antenna concept to the 90^o corner reflector. [L1][CO4][5M]
5. (a) Explain about Zoned Lens antenna. [L1][CO4][5M]
   (b) A parabolic reflector antenna with diameter 20 m is designed to operate at frequency of 6 GHz and illumination efficiency of 0.54.Calculate antenna gain and decibels. [L1][CO4][5M]
6. (a) Explain the features of corner reflectors. [L1][CO4][5M]
   (b)Explain the principle of operation of dielectric lens antenna. [L1][CO4][5M]
7. (a) Explain the different tolerances in the lens antenna. [L1][CO4][5M]
   (b) Write short notes on non-metallic dielectric lenses. [L1][CO4][5M]
8. (a) Explain the basic principle of operation in lens antenna & distinguish between different types of lens antenna used in practice. [L1][CO4][5M]
   (b) With a neat sketch explains the constructional features of parabolic reflector and obtain expression for its curved profile. [L1][CO4][5M]
9. A parabolic dish provides a power gain of 50 dB at 10 GHz with 70% efficiency. Find out i)HPBW ii) BWFN iii) Diameter [L1][CO4][10M]
10. (a) What is a patch antenna? [L1][CO4][2M]
    (b) What are the applications of MSA? [L1][CO4][2M]
    (c) What is zoning? [L1][CO4][2M]
    (d) A parabolic reflector having the diameter of 2.1 m and used at 9GHz. Calculate the gain. [L1][CO4][2M]
    (e) Mention different methods of feeds of parabolic reflector antennas. [L1][CO4][2M]

UNIT IV

Antenna Arrays & Measurements

1. (a) what is antenna array? Define point sources and uniform linear array. [L1][CO4][5M]
   (b) write short notes on broad side and end fire arrays. [L1][CO4][5M]
2. (a) two identical point sources separated by a distance'd'. Each source having a field pattern given by $\boldsymbol{E_0} = \boldsymbol{E_1}\sin\Theta$. If $d = \frac{\lambda}{2}$ and the phase angle $\alpha=0$. Derive an expression for total field and also plot the pattern. [L1][CO4][5M]
   (b) Derive the expression for far field pattern of an array of two isotropic points Sources at equal amplitude & opposite phase. [L1][CO4][5M]
3. (a) Write short notes on
   i) Array of two point sources ii) uniform linear array. [L1][CO4][5M]
   (b) A linear broad side array consists of four equal isotropic in phase point sources with $\lambda/3$ spacing (overall length of array=λ).Find the directivity and the beam width.[L1][CO4][5M]
4. (a) Explain pattern multiplication with appropriate examples. [L1][CO4][5M]
   (b) Derive the expression for far field pattern of an array of two isotropic point sources at unequal amplitude & any phase. [L1][CO4][5M]
5. (a) Write short notes on broad side and end fire arrays. [L1][CO4][5M]
   (b) A broad side array operating at 10cm wavelength consists of 4 half wave dipole spaced 50 cm each element carries radio frequency current in the same phase and of magnitude 0.5 amps. Calculate the radiated power, half width of major lobe. [L1][CO4][5M]
6. (a) Explain any two techniques for antenna gain measurement. [L1][CO4][5M]
   (b) Show that Directivity of BSA, L>>d is $D_0=2(d/\lambda)$. [L1][CO4][5M]
7. Write short notes on [L1][CO4][5M]
   i) Linear array ii) binomial Array iii) EFA with increased directivity
8. (a) Explain near & far fields with respect to antenna measurements. [L1][CO4][5M]
   (b) Define directivity. Give the procedure for the measurement of directivity. [L1][CO4][5M]
9. (a) Explain the gain measurement using absolute & comparison methods. [L1][CO4][5M]
   (b)What is principle of pattern multiplication? List the advantages and disadvantages. [L1][CO4][5M]
10. (a) What are the different types of array? [L1][CO4][2M]
    (b) What is tapering of arrays? [L1][CO4][2M]
    (c) What are the sources of error while measuring the antenna parameters?[L1][CO4][2M]
    (d) Mention the methods of directivity measurements. [L1][CO4][2M]
    (e) Find the minimum spacing between the elements in a broadside array of 10 isotropic radiators to a have directivity of 7db. [L1][CO4][2M]

UNIT - V

Wave Propagation

1. (a) Discuss the field strength variation with skip distance & virtual height. [L1][CO4][5M]
   (b) Discuss the atmospheric effects in space wave propagation. [L1][CO4][5M]
2. (a) Explain ground wave propagation. [L1][CO4][5M]
   (b) A radio transmitted operating at a frequency 1.69 MHz is required to provide a ground wave having strength of 0.5 mv/m at a distance of 16 km. The transmitting antenna with an efficiency of 50% produces a radiating field proportional to cosΘ. The ground wave has $\sigma = 5x\ 10^{-5}$ ʊ/cm and ε_r = 15.Calculate the power transmitted. [L1][CO4][5M]
3. (a) Explain about scattering phenomenon & Super refraction. [L1][CO4][5M]
   (b) Explain about plane earth reflections in ground wave propagation. [L1][CO4][5M]
4. (a)Explain the structure of Inosphere [L1][CO4][5M]
   (b) It is required to establish a short wave communication between two points in earth's surface separated by 1200 km. Calculate the f_{MUF} and angle of take off the transmitted wave from the following data. Highest signal frequency return to earth after vertically upward propagation is 7.10MHz and virtual height of ionized layer is 200 km. Assume surface of earth to be flat. [L1][CO4][5M]
5. (a) Explain the terms [L1][CO4][10M]
   i) Critical frequency ii) Ray path iii) draw the structure of ionosphere; how it varies with weather
6. Explain the structure of Atmosphere. [L1][CO4][10M]
7. (a)VHF Communication is to be established with 50W transmitted at 100MHz. Calculate the LOS distance if the heights of transmitting and receiving antennas are respectively 50 m and 10m.Assuming the capture area of transmitting antenna is 25 m^2, calculate the field strength at the receiving antenna end neglecting ground reflected wave. [L1][CO4][5M]
   (b) What is fading & list different types of fading and explain. [L1][CO4][5M]
8. (a) Explain the refraction and reflection mechanisms in sky wave propagation. [L1][CO4][5M]
   (b) Explain the terms i) Critical frequency ii) MUF. [L1][CO4][5M]
9. (a) Explain the following [L1][CO4][5M]
   i) Virtual height ii)Skip distance iii)Multi-hop propagation
   (b) Discuss the effects of earth's curvature. [L1][CO4][2M]
10. (a) Define Sky wave and Ground Wave. [L1][CO4][2M]
    (b) What are inverse and multi path fading? [L1][CO4][2M]
    (c) What are the factors that affect the propagation of radio waves? [L1][CO4][2M]
    (d) What is meant by Faraday's rotation? [L1][CO4][2M]
    (e) Determine the height of the transmitting antenna to obtain a maximum distance of transmission up to 38km from a 24 meter high receiving antenna? [L1][CO4][2M]

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