SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

18ECE 322 ANTENNA WAVE PROPAGATION

Question No.	Questions	PO Attainment
UNIT – 1: ANTENNA FUNDAMENTALS		
PART A (2 Marks)		
1	Define gain and directivity of an antenna.	PO1
2	What is the significance of radiation resistance of an antenna?	PO1
3	Define effective aperture of an antenna.	PO1
4	Define antenna efficiency?	PO1
5	What is meant by reciprocity Theorem?	PO1
6	Define Half power Beam width.	PO1
7	Derive the relation between directivity and beam solid angle.	PO1
8	Derive the relationship between radiation resistance and efficiency.	PO1
9	Draw the radiation pattern of: (i) Directional antenna. (ii) Isotropic antenna.	PO1
10	Define the following parameters w.r.t antenna: Beam area Steradians & radians	PO1
11	Define wave velocity and Group velocity.?	PO1
12	Define an antenna.	PO1
13	What is meant by radiation pattern?	PO1
14	What is meant by effective height?	PO1
15	What are the field zone?	PO1
16	What is meant by Polarization?	PO1
17	What is meant by front to back ratio?	PO1
18	What is radiation resistance?	PO1
19	What do you understand by retarded current?	PO1
20	What is a Infinitesimal Dipole?	PO1
21	What is the radiation resistance of a half wave dipole.	PO1
22	What is a dipole antenna?	PO1
23	Why folded dipole antenna is used in yagi uda antenna?	PO1
24	What are the types of field zone?	PO1
25	Define radian and steradian.	PO1
26	State the relation between standing wave ratio and reflection coefficient.	PO1
PART-B (10 Marks)		
1	Compute the radiation resistance of a half wave dipole. Hence give the value of a quarter wavelength monopole.	PO1, PO2
2	State and explain the following antenna parameters: (i) Directivity. (ii)	PO1, PO2

	Half Power Beam Width (HPBW) with suitable examples.	
3	A half-wave dipole is located on a perfectly conducting ground with sinusoidal current distribution. Deduce the expression for average power radiated by the dipole.	PO1, PO2
4	With suitable block diagram, give the steps to measure radiation pattern of an antenna considering E-plane & H – plane.	PO1, PO2
5	State and explain the following terms with respect to antenna: (i) Radiation intensity. (ii) Directive gain (iii) Effective height. (iv) Beamwidth.	PO1, PO2
6	Prove that the directivity of an infinitesimal electric dipole is 1.76 dB.	PO1, PO2
7	Starting from the expressions of retarded potentials, derive the far field expressions for small electric dipole and also obtain the expression for radiation resistance of the dipole.	PO1, PO2
8	Draw Thevenin's equivalent circuit of an antenna in its transmitting mode, and give the expression for power delivered to the antenna for radiation in terms of the circuit parameters.	PO1, PO2
9	Give the far field expressions and radiation resistance for a small loop antenna.	PO2
10	What are the different types of horn antennas? Discuss about them briefly with suitable sketches.	PO1
11	With suitable sketches, explain the procedure to determine the radiation pattern of an antenna in both the planes.	PO1
12	Derive the expression for radiation fields of a centre fed half wavelength dipole antenna. Sketch the radiation pattern.	PO2
13	Prove the reciprocity theorem as applicable to antennas and hence show the equality of directional pattern for transmission and reception by same antenna.	PO2
14	Compare far fields of small loop antenna and short dipole antenna.	PO2
15	What is the radiation resistance of antenna? Derive the expression for radiation resistance of half wave length dipole antenna.	PO1, PO2
16	What is near field and far field region? Why is the condition $2D^2/\lambda$	PO2

	chosen for far field region.	
17	With a neat sketch explain the procedure of radiation pattern measurement.	PO1
18	Derive the relation between Directivity and effective aperture of an antenna.	PO1
19	Calculate the power gain of a Half wave dipole whose ohmic losses and directive gain are 7 ohms and 1.64 respectively.	PO2
20	Derive expressions for the components of the radiated field of an alternating current element.	PO2
21	What is meant by the effective area of an antenna? How is it related to the gain?	PO1
22	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?	PO2
23	Explain about different polarizations with suitable expressions and sketches.	PO1
24	Give the far field expressions and radiation resistance for a small loop antenna.	PO2
25	Compare far fields of small loop antenna and short dipole antenna.	PO2
26	Find the radiation resistance of a loop antenna of diameter 0.5 m operating at a frequency of 1 MHz.	PO2
27	Calculate the power gain of a Half wave dipole whose ohmic losses and directive gain are 7 ohms and 1.64 respectively.	PO2
28	Discuss about loop antenna. What are the disadvantages of loop antenna? What are applications loop antennas?	PO1

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18ECE 322 ANTENNA WAVE PROPAGATION

Question No.	Questions	PO Attainment
	UNIT – 2: ANTENNA ARRAYS	
	PART A (2 Marks)	
1	What is meant by array?	PO1
2	What are the types of array?	PO1
3	What is Broad side array?	PO1
4	Define End fire array?	PO1
5	What is the principle of the pattern multiplication?	PO1
6	What is the advantage of pattern multiplication?	PO1
7	What is a binomial array?	PO1
8	State pattern multiplication.	PO1
9	What are the advantages of antenna arrays?	PO1
	PART-B (10 Marks)	
1	With neat diagrams, describe the principle of working of 3 element Yagi antenna and list out its design requirements.	PO1, PO2
2	With neat sketches, discuss about the folded dipole and its input impendence.	PO1, PO2
3	Explain the working principle of Yagi – Uda antenna with suitable sketches.	PO2
4	Distinguish between broad side array and end fire array.	PO1
5	Deduce the expression for the Array Factor due to an N-element uniform linear antenna array and draw its plot for N = 4.	PO4
6	Explain the role and size of each parasitic element in a 3-element array antenna & draw the 6-element Yagi – Uda antenna with dimensions.	PO4
7	Prove that the beamwidth of a long end-fire array proposed by Hansen-Woodyard is 71% of beamwidth obtained from ordinary end-fire array.	PO4
8	Given a linear uniform array of 10 isotropic antennas with quarter-wavelength separation between them, find the directivity of the array if it is: (i) broadside. (ii) end-fire. Comment on the result obtained.	PO4
9	Explain the working of folded dipole antenna.	PO2
10	Draw the sketch of Yagi Uda array antenna. Prove how the longer antenna behind the main antenna behaves as a reflector and the shorter antenna in front of main antenna acts as a director.	PO4

11	What is binomial array antenna. What its basic principle of working? Mention the advantages and disadvantages.	PO2
12	What is the principle of pattern multiplication explain with an example.	PO1
13	Design Yagi-Uda antenna of 6 elements to provide gain of 12 dB if the operating frequency is 200 MHz.	PO4
14	Derive an Expression of array factor for an n-element uniform array.	PO2
15	Explain in detail about the Binomial array and differentiate it with a linear array.	PO2
16	Derive an expression for the radiation pattern of a Broadside uniform linear array of 4-elements with λ / 2 spacing and obtain its radiation pattern.	PO4
17	Write short notes on Yagi-Uda array Antenna and its applications, advantages and drawbacks.	PO2
18	Discuss broadside array and end fire array with neat diagrams.	PO2
19	Derive expression for antenna array factor.	PO2
20	An end fire array consisting of several half wave length long isotropic radiators having directive gain of 30. Find the length of array for broad side antenna?	PO2
21	A broadside array of identical antennas consists 8 isotropic radiators separated by distance λ/2. Find radiation field in a plane containing the line of array showing directions of maxima and null.	PO4

Question No.	Questions	PO Attainment
	UNIT – 3 & 4: VHF- UHF AND MICROWAVE ANTENNAS	
	PART A (2 Marks)	
1	What is a loop antenna?	PO1
2	How to increase the radiation resistance of a loop antenna.	PO1
3	What are the parameters to be considered for the design of an helical antenna?	PO1
4	What are the types of radiation modes of operation for an helical antenna.	PO1
5	Which antenna will produce circularly polarized waves	PO1
6	List the applications of helical antenna.	PO1
7	State Babinet's principle.	PO1
8	Give the features of Horn antenna.	PO1
9	Give the features of pyramidal horn antenna.	PO1
10	Draw the different types of Horn antennas.	PO1
11	What are the types of reflector antennas?	PO1
12	What is corner reflector?	PO1
13	What is paraboloid?	PO1
14	What are the various feeds used in reflectors?	PO1
15	What are the features of microstrip antenna?	PO1
16	List the advantages of micro strip antennas.	PO1
17	List the disadvantages of micro strip antennas.	PO1
18	Mention the applications of micro strip antenna.	PO1
19	List the applications of helical antenna.	PO1
20	Define pitch angle of helical antenna.	PO1
21	What is reconfigurable antenna?	PO1
22	What is Yagi Uda antenna?	PO1
23	Compare short dipole and half wave dipole.	PO1
24	The radiation resistance of an antenna is 72Ω and loss resistance is 8Ω. What is the directivity if power gain is 15?	PO2
25	A lossless line has a characteristics impedance of 400 ohms. Determine the standing wave ratio if the receiving end impedance is 800+ j 0.0 ohms.	PO2
	PART-B (10 Marks)	
1	Give advantages and limitations of microstrip patch antennas.	PO1, PO2
2	With reference to paraboloids, explain: f/d ratio. (b) Spill over and	PO1, PO2

	aperture efficiency. Front to back ratio. (d) Type of feeds	
3	Discuss about design considerations of pyramidal horn antenna.	PO2
4	What are the characteristics of Microstrip antennas? Explain in detail.	PO1
5	State first null beam width, and find out its value and power gain(in dBs) of 2 m paraboloid reflector operating at 6 GHz.	PO4
6	Discuss about different structures of dielectric lenses, & their principle of operation with neat sketches.	PO1
7	A parabolic dish provides a gain of 75 dB at a frequency of 15 GHz. Calculate capture area of the antenna and half power and first null beam widths.	PO4
8	Discuss about the operation of helical antenna in two different modes along with necessary sketches and expressions.	PO2
9	What are the different types of horn antennas? Discuss about them briefly with suitable sketches.	PO1
10	Give the comparison between parabolic and corner reflectors.	PO1
11	Explain the principle of Cassegrain reflector with suitable sketch & mention its applications.	PO2
12	Using principle of equality of electrical path length, deduce the expression for path that determines the shape of lens antenna.	PO2
13	Sketch a rectangular patch antenna indicating the electric field lines in it. Explain the characteristics of microstrip antennas.	PO1
14	Explain in detail about different feed systems that are used for parabolic reflector antennas.	PO2
15	Derive the construction and basic principles of operation of a helical antenna under (i) normal mode of operation (ii) axial mode of operation	PO1
16	What is electromagnetic horn antenna? What are the various types of horn? What are their practical applications?	PO1
17	Discuss the principle of operation and the consideration which have to be gone into the design and construction of parabolic reflector	PO2

	antenna.	
18	Explain the various feeding mechanisms used in parabolic reflector antennas.	PO1
19	Show that the contour of a nonmetallic dielectric lens antenna is a hyperbola.	PO2
20	Explain the principle of working of lens antenna.	PO2
21	With a neat sketch explain the procedure of radiation pattern measurement.	PO2
22	Discuss in detail about the pyramidal Horn antenna and write down its merits and demerits.	PO2
23	What are the design considerations of pyramidal Horns? Explain.	PO2
24	Explain about the operating principle of Helical antenna in Normal and Axial modes.	PO2
25	With necessary diagrams explain the principle of operation of Lens antennas and also discuss its advantages and disadvantages.	PO2
26	Discuss different types of horn antennas with neat sketches.	PO2
27	With neat sketch, explain the operation of helical antenna.	PO2
28	Explain the geometry of paraboloidal reflector with neat diagram.	PO1
29	Compare UHF and VHF antennas.	PO1

Question No.	Questions	PO Attainment
UNIT –5: WAVE PROPAGATION		
PART A (2 Marks)		
1	Define Sky wave.	PO1
2	Define Tropospheric wave.	PO1
3	Define Ground wave.	PO1
4	What are the type of Ground wave.	PO1
5	What is meant by Space Wave.?	PO1
6	What is meant by Surface Wave.?	PO1
7	What is meant by fading.?	PO1
8	What is multi path fading.?	PO1

9	What is meant by diversity.	PO1
10	What are the factors that affect the propagation of radio waves.?	PO1
11	Define critical frequency.	PO1
12	Define maximum Usable Frequency.	PO1
13	Define skip distance.	PO1
14	What are tropospheric waves?	PO1
15	What are the modes of propagation?	PO1
16	Why ground wave is always a vertically polarized wave?	PO1
17	What is duct propagation?	PO1
18	What is an ionospheric propagation?	PO1
19	What is virtual height?	PO1
20	What are the special features of troposcatter propagation?	PO1
21	Draw the various layers of atmospheric structure.	
PART-B (10 Marks)		
1	What are the different paths used for propagating radio waves from 300 kHz and 300 MHz? Explain.	PO1, PO2
2	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 200 km and its critical frequency is 5 MHz, Calculate the MUF for the given path. Also calculate the electron density in the ionospheric layer.	PO1, PO2
3	Derive the expression for maximum usable frequency (MUF) pertaining to sky wave propagation.	PO2
4	A transmitting antenna of 100 m height radiates 40 kW at 100 MHz uniformly in azimuth plane. Calculate the maximum line of sight (LOS) range and strength of the received signal at 16 m high receiving antenna at a distance of 10 km. At what distance would be signal strength reduce to 1 mV/m.	PO2
5	Discuss about the structural details of the region above the earth surface up to ionosphere.	PO1
6	The maximum distance between the transmitting and receiving antenna of TV towers is 72 km. If the ratio of height of transmitting and receiving antennae is 16:25, what are the heights of towers? Assume that the radius of the earth is about 6.371 × 106 km.	PO2
7	Derive the expression for maximum usable frequency (MUF) considering flat and curved surfaces of the earth separately in	PO2

	terms of critical frequency and other parameters.	
8	List out the effects of (i) Imperfect Earth. (ii) Curvature of the Earth.	PO1
9	Describe the structure of the ionosphere and how its layers are aiding long distance communication at radio frequencies.	PO1
10	A plane wave at 20 MHz is transmitted to ionosphere and reflected from a height of 500 km from the flat earth. If the refractive index corresponding to maximum electron density is 0.5, determine the horizontal range for which the signal frequency is MUF.	PO2
11	Explain the phenomenon of ducting? What are the conditions required for manifestation of this phenomenon.	PO1
12	Briefly explain the tropospheric propagation and multi-hop propagation.	PO1
13	Explain the following terms with diagram (i) Duct propagation (ii) Skip zone	PO1
14	Find the maximum range of Tropospheric transmission for which the height of transmitting antenna is 100ft and that of receiving antenna is 50 ft.	PO2
15	Derive the relation between Maximum usable frequency (MUF) and skip distance.	PO2
16	Describe the troposphere and explain how ducts can be used for microwave Propagation.	PO1
17	Write a short note on Multi-hop propagation.	PO1
18	Deduce an expression for the critical frequency of an ionized region in terms of its Maximum ionization density.	PO2
19	Write short notes on: Virtual height Line of sight propagation Effect of earth's curvature.	PO1
20	Briefly describe the following terms connected with sky-wave propagation: Critical frequency-Maximum usable frequency Skip distance.	PO1