



**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Antennas & Wave propagation (23EC0413)

Course & Branch: B.Tech. – ECE

Year & Sem: III-B.Tech & I-Sem

Regulation: R23

UNIT-I

ANTENNA BASICS & DIPOLE ANTENNAS

1	a)	Define antenna.	[L1][CO1]	[2M]
	b)	List out any four antenna Parameters.	[L1][CO1]	[2M]
	c)	What is an Isotropic Radiator?	[L1][CO1]	[2M]
	d)	Define Effective Height of antenna.	[L1][CO1]	[2M]
	e)	Define Resolution of antenna.	[L1][CO1]	[2M]
2	a)	Explain the radiation mechanism in single wire, two wire, and dipoles.	[L2][CO1]	[6M]
	b)	Define the radiation pattern of an antenna and its types with neat sketch.	[L3][CO1]	[4M]
3	a)	Explain the following terms. i). Main lobe ii). Side lobe iii). Beam width	[L2][CO1]	[6M]
	b)	Explain the following terms. i). Beam area ii). Effective length	[L2][CO1]	[4M]
4		Explain the following terms. i). Radiation intensity ii). Beam Efficiency iii). Directivity	[L2][CO1]	[10M]
5	a)	Define the following parameters. i). Antenna gain ii). Aperture Efficiency	[L1][CO1]	[4M]
	b)	A dipole having a length of 3 cm is operated at 1 GHz. The efficiency factor $K=0.6$. Calculate antenna gain and directivity.	[L3][CO1]	[6M]
6	a)	State the following antenna theorems. i). Reciprocity theorem ii). Helmholtz theorem.	[L1][CO1]	[6M]
	b)	Tabulate basic Maxwell's equations with other relevant relations.	[L1][CO1]	[4M]
7	a)	Derive and explain the expression for retarded potential.	[L3][CO1]	[5M]
	b)	An antenna receives a maximum power of $2\mu\text{W}$ from a radio station. Calculate the maximum effective area if the antenna is located in the far field station where $E=50\text{mV/m}$.	[L3][CO1]	[5M]
8		Discuss the concepts of radiation from the small electric dipole	[L2][CO1]	[10M]
9		Derive the radiation parameters of Quarter wave monopole antenna using field components	[L3][CO1]	[10M]
10		Derive the radiation parameters of Half wave dipole using field components.	[L3][CO1]	[10M]
11	a)	An antenna has a radiation resistance of 72Ω , and a loss resistance is 8Ω if the powers gain of 16. Calculate the directivity of the antenna and the length of half wave dipole at 30MHz.	[L3][CO1]	[5M]
	b)	Explain the current distributions on thin linear center-fed antennas of different lengths.	[L2][CO1]	[5M]

UNIT –II
HF, VHF AND UHF ANTENNAS

1	a)	Define small loop antenna.	[L1][CO2]	[2M]
	b)	List the parasitic elements?	[L1][CO2]	[2M]
	c)	Write the expression for directivity of small loop and large loop antennas.	[L1][CO2]	[2M]
	d)	Write the equation for half power beam width of optimum horn antenna.	[L1][CO2]	[2M]
	e)	State Fermat's Principle.	[L1][CO2]	[2M]
2	a)	Discuss about the loop antenna and its types with neat sketch.	[L2][CO2]	[6M]
	b)	Compare the far fields of a small loop and a short dipole.	[L2][CO2]	[4M]
3		Derive the radiation resistance for small loop and large loop.	[L3][CO2]	[10M]
4		Explain the construction and operation of a Yagi-Uda antenna with neat sketch.	[L2][CO2]	[10M]
5	a)	Design Yagi-Uda antenna of six elements to provide a gain of 12dB if the operating frequency is 200 MHz.	[L3][CO2]	[5M]
	b)	List the advantages, disadvantages and applications of Yagi-Uda antenna	[L1][CO2]	[5M]
6	a)	Discuss the folded dipole antenna and its input impedance.	[L2][CO2]	[6M]
	b)	Derive the input impedance of a folded dipole antenna formed by three parallel half-wave elements.	[L3][CO2]	[4M]
7		Discuss the design considerations of log periodic antenna.	[L2][CO2]	[10M]
8	a)	Explain construction and operation of the helical antenna.	[L2][CO2]	[5M]
	b)	Explain design considerations of Monofilar Axial-mode Helical antenna.	[L2][CO2]	[5M]
9	a)	Discuss the helical antenna of normal mode and its radiation pattern.	[L2][CO2]	[6M]
	b)	Calculate the directivity of 20 turn helix with $\alpha = 12^\circ$ and circumference equals to one wavelength.	[L3][CO2]	[4M]
10	a)	Discuss the helical antenna of axial mode and its radiation pattern.	[L2][CO2]	[5M]
	b)	Explain about the horn antenna types & its characteristics.	[L2][CO2]	[5M]
11	a)	Discuss the design considerations of pyramidal horn antenna.	[L2][CO2]	[6M]
	b)	Calculate the directivity of pyramidal horn antenna with an aperture. If size 12x12cm operating with 3.2cm wavelength.	[L3][CO2]	[4M]

UNIT –III
MICROWAVE ANTENNAS

1	a)	List two advantages of microstrip antenna.	[L1][CO3]	[2M]
	b)	Define rectangular patch antenna?	[L1][CO3]	[2M]
	c)	Define corner reflector antenna?	[L1][CO3]	[2M]
	d)	Name the feed methods used for parabolic reflectors.	[L1][CO3]	[2M]
	e)	Define tolerance of lens antenna?	[L1][CO3]	[2M]
2	a)	Explain about micro strip antenna and its types with neat diagrams.	[L2][CO3]	[6M]
	b)	Give the advantages and limitations of micro strip antenna.	[L2][CO3]	[4M]
3	a)	Discuss the construction of a rectangular patch antenna	[L2][CO3]	[7M]
	b)	What are the applications of microstrip antenna?	[L1][CO3]	[3M]
4		Discuss the characteristics in detail of microstrip Antenna.	[L2][CO3]	[10M]
5	a)	Design a rectangular microstrip patch antenna to resonate at 2.4 GHz using substrate ($\epsilon_r \approx 2.2$) of height 1.6 mm.	[L3][CO3]	[5M]
	b)	Explain the types of reflector antenna.	[L2][CO3]	[5M]
6	a)	Draw and explain the principle of parabolic reflector.	[L3][CO3]	[5M]
	b)	Explain the principle of operation of a flat sheet reflector antenna.	[L2][CO3]	[5M]
7	a)	A parabolic dish with $D = 1.2$ m, $\eta = 65\%$ operates at $f = 10$ GHz. i). Calculate the gain in dBi. ii). Calculate the HPBW (degrees) and effective aperture.	[L3][CO3]	[5M]
	b)	Describe the differences between a flat sheet reflector and a corner reflector.	[L2][CO3]	[5M]
8	a)	Explain the different feed methods used for parabolic reflectors.	[L2][CO3]	[6M]
	b)	A parabolic dish provides a power gain of 50 dB at 10 GHz with 70% efficiency. Find out. i) HPBW ii) BWFN	[L3][CO3]	[4M]
9	a)	Explain the operation of a Cassegrain reflector antenna.	[L2][CO3]	[7M]
	b)	Write the advantages of Cassegrain feed method.	[L1][CO3]	[3M]
10	a)	Explain the Geometry of the non-metallic dielectric lens antenna.	[L2][CO3]	[5M]
	b)	Explain the concept of zoning in lens antenna.	[L4][CO3]	[5M]
11	a)	Explain the operation of an offset reflector antenna.	[L2][CO3]	[5M]
	b)	List the advantages and applications of the lens antenna.	[L1][CO3]	[5M]

UNIT –IV
ANTENNA ARRAYS & ANTENNA MEASUREMENTS

1	a)	Define antenna array.	[L1][CO4]	[2M]
	b)	Define broadside array?	[L1][CO4]	[2M]
	c)	What is pattern multiplication?	[L1][CO4]	[2M]
	d)	Identify one source of error in antenna measurements.	[L1][CO5]	[2M]
	e)	What is Antenna under Test (AUT)?	[L1][CO5]	[2M]
2	a)	What is antenna array and explain its types?	[L2][CO4]	[8M]
	b)	Define the point sources.	[L1][CO4]	[2M]
3	a)	What are the different cases of arrays of 2-point sources?	[L1][CO4]	[3M]
	b)	Derive the expression for far field pattern of an array of 2 isotropic point sources at equal amplitude & same phase.	[L3][CO4]	[7M]
4		Derive the expression for far field pattern of an array of 2 isotropic point sources at equal amplitude & opposite phase.	[L3][CO4]	[10M]
5	a)	Explain pattern multiplication with any one case.	[L2][CO4]	[5M]
	b)	Explain n-element uniform linear array.	[L2][CO4]	[5M]
6	a)	Discuss Broad side array and its radiation pattern.	[L2][CO4]	[5M]
	b)	Discuss End fire array and its radiation pattern.	[L2][CO4]	[5M]
7	a)	Explain End fire array with increase directivity and derive the directivity?	[L2][CO4]	[7M]
	b)	Explain the concept of non-uniform amplitude distribution of BSA?	[L2][CO4]	[3M]
8	a)	Find the minimum spacing between the elements in a broad side array of 10 isotropic radiators to have directivity of 7dB.	[L3][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 same phase and magnitude 0.25A. Calculate the radiated power and half power beam width of major lobe	[L3][CO4]	[5M]
9	a)	Explain sources of Errors in Antenna measurement.	[L2][CO5]	[5M]
	b)	Explain the set-up of directivity measurement.	[L2][CO5]	[5M]
10		Explain the radiation pattern measurement with fundamental procedure, arrangements and distance requirement.	[L2][CO5]	[10M]
11	a)	Explain gain measurement by direct comparison method.	[L2][CO5]	[5M]
	b)	Explain gain measurement using absolute method.	[L2][CO5]	[5M]

UNIT –V
WAVE PROPAGATION

1	a)	What are the different modes of propagation?	[L1] [CO6]	[2M]
	b)	Define skip distance.	[L1] [CO6]	[2M]
	c)	Mention the types of fading.	[L1] [CO6]	[2M]
	d)	Define critical frequency	[L1] [CO6]	[2M]
	e)	Define optimum working frequency (OF).	[L1] [CO6]	[2M]
2	a)	Discuss about refraction and reflection of EM waves.	[L2] [CO6]	[6M]
	b)	Discuss about Ray path with a neat sketch.	[L2] [CO6]	[4M]
3	a)	Explain the structure of Ground wave propagation with a neat sketch.	[L2] [CO6]	[5M]
	b)	Discuss about space wave and surface wave.	[L2] [CO6]	[5M]
4	a)	Explain the concept in brief of Super refraction and M-curves.	[L2] [CO6]	[4M]
	b)	Explain about the duct propagation and scattering phenomenon?	[L2] [CO6]	[6M]
5	a)	Discuss the effects of tropospheric propagation, fading and patch losses?	[L2] [CO6]	[6M]
	b)	Determine the maximum usable frequency for a critical frequency of 20 MHz and an angle of incidence of 35° .	[L3] [CO6]	[4M]
6		Explain the structure and variations of the ionosphere layers with a neat diagram.	[L2] [CO6]	[10M]
7	a)	Discuss about refraction and reflection of sky wave propagation.	[L2] [CO6]	[5M]
	b)	Discuss about Energy losses in ionosphere.	[L2] [CO6]	[5M]
8	a)	Explain critical frequency with its expression.	[L2] [CO6]	[6M]
	b)	Explain Maximum usable frequency with its expression.	[L2] [CO6]	[4M]
9	a)	Write a short note on lowest usable frequency (LUF) and working frequency.	[L2] [CO6]	[5M]
	b)	Explain Virtual height and its significance.	[L2] [CO6]	[5M]
10	a)	Explain Skip distance and derive its expression.	[L2] [CO6]	[6M]
	b)	Explain the relation between MUF and skip distance.	[L2] [CO6]	[4M]
11	a)	Give a brief note on multi hop propagation and energy loss in Ionosphere.	[L2] [CO6]	[6M]
	b)	For a flat earth assume that at 400 km reflection takes place. The maximum density of ionosphere corresponds to a refractive index of 0.9 at 10 MHz. Calculate the range for which maximum usable frequency is 10 MHz.	[L3] [CO6]	[4M]