Course Code: 18EC0419 **R18**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Antennas and Wave Propagation (18EC0419)
Year & Sem: III-B.Tech & II-Sem

Course & Branch: B.Tech - ECE
Regulation: R18

UNIT –I
ANTENNA& RADIATION PARAMETERS

1	**a**	Define an Antenna.	[L1][CO1]	**[2M]**
	b	Define Radiation Intensity of an antenna.	[L1][CO1]	**[2M]**
	c	Define Radiation Resistance of an antenna.	[L1][CO1]	**[2M]**
	d	Define Radiation Pattern of an antenna.	[L1][CO1]	**[2M]**
	e	Define Directivity of an antenna.	[L1][CO1]	**[2M]**
2	Explain the following **(a)** Antenna Parameters &its types. **(b)** Radiation Pattern &Antenna Bandwidth.		 [L2][CO1] [L2][CO1]	 **[5M]** **[5M]**
3	**(a)** Explain Radiation Intensity and Antenna Gain. **(b)** Write short notes on Radiation Pattern and Beam Efficiency**.**		[L2][CO1] [L1][CO1]	**[5M]** **[5M]**
4	Explain the following **(a)** Antenna Directivity and Effective aperture of an Antenna **(b)** Antenna Noise Temperature and Radiation Resistance		 [L2][CO1] [L2][CO1]	 **[5M]** **[5M]**
5	Explain the following **(a)** Antenna Matching. **(b)** Antenna Efficiency and Front to Back Ratio		 [L2][CO1] [L2][CO1]	 **[5M]** **[5M]**
6	A dipole having a length of 3 cm is operated at 1 GHz. The efficiency factor K=0.6. calculate the radiation resistance, antenna gain and effective aperture		[L3][CO2]	**[10M]**
7	Derive expression for Electric and Magnetic Field radiated by Half Wave Dipole and sketch its Field Strength pattern.		[L3][CO3]	**[10M]**
8	Derive expression for Electric and Magnetic Field radiated by Quarter Wave Monopole and Sketch its Field Strength pattern.		[L3][CO3]	**[10M]**
9	Draw and Explain the concepts of radiation from the oscillating dipole		[L2][CO2]	**[10M]**
10	**(a)** Calculate radiation resistance of a dipole antenna of length $\lambda/8$ m. **(b)** An antenna has a radiation resistance is 72Ω and a loss resistance is 8Ω.If the power gain is 16. Calculate the directivity of the antenna.		[L2][CO1] [L2][CO1]	**[3M]** **[7M]**
11	**(a)** What is meant by radiation pattern? **(b)** Find the length of half wave dipole at 30MHz. **(c)** Define Effective Aperture and give its expression? **(d)** What are the different types of apertures?		[L1][CO1] [L1][CO1] [L1][CO1] [L1][CO1]	**[2M]** **[3M]** **[3M]** **[2M]**

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UNIT –II
VHF, UHF AND MICROWAVE ANTENNAS – I

1	**a**	What are the advantages of Yagi-Uda antenna?	[L1][CO4]	**[2M]**
	b	Define End fire mode in helical antenna.	[L1][CO3]	**[2M]**
	c	Define axial ratio in helical antenna.	[L1][CO3]	**[2M]**
	d	What are the salient features of horn antenna?	[L1][CO4]	**[2M]**
	e	What are parasitic elements and give its significance.	[L1][CO4]	**[2M]**
2		**(a)** Discuss about the Folded dipole antenna and its input impedance.	[L2][CO4]	**[7M]**
		(b) What are parasitic elements &where they are used?	[L1][CO4]	**[3M]**
3		**(a)** Explain about construction and operation of Yagi-Uda antenna with neat sketch.	[L2][CO4]	**[5M]**
		(b) Explain about the construction and operation of helical antenna	[L2][CO4]	**[5M]**
4		**(a)** Discuss about the helical antenna geometry, axial mode of radiation and its applications.	[L2][CO3]	**[5M]**
		(b) Discuss about the helical antenna geometry, Normal mode of radiation and its applications.	[L2][CO4]	**[5M]**
5		**(a)** Discuss about the horn antenna types & its characteristics.	[L2][CO4]	**[5M]**
		(b) Discuss the design considerations of pyramidal horn antenna.	[L2][CO4]	**[5M]**
6		**(a)** Discuss the types of horn antennas.	[L2][CO4]	**[5M]**
		(b) Write short notes on i) Folded dipole antenna ii) Yagi-Uda array	[L1][CO4]	**[5M]**
7		**(a)** Calculate the directivity of 20 turn helix with $\alpha = 12^0$and circumference equals to one wavelength.	[L3][CO4]	**[7M]**
		(b) Give the applications of helical antennas.	[L1][CO4]	**[3M]**
8		**(a)** Discuss advantages, disadvantages and applications of Yagi-Uda antenna	[L2][CO4]	**[4M]**
		(b) Calculate the directivity and half power beamwidth. For a 20-turns helical antenna operating at 3GHz with circumference of 10cm and spacing between the turns0.3 wave Length is operating at 3GHz.	[L3][CO4]	**[6M]**
9		**(a)** Write short notes on Helical antenna and its Modes.	[L1][CO3]	**[5M]**
		(b) Calculate the directivity of pyramidal horn antenna with an aperture. If size 12x12cm operating with 3.2cm wavelength.	[L3][CO4]	**[5M]**
10		(a) Write short notes on Horn antenna.	[L1][CO4]	**[3M]**
		(b) Design Yagi-Uda antenna of six elements to provide a gain of 12dB if the operating frequency is 200 MHz.	[L6][CO4]	**[7M]**
11		**(a)** Draw and explainthe three elements of Yagi-Uda array	[L2][CO4]	**[3M]**
		(b) Define Normal mode and axial mode in helical antenna?	[L1][CO3]	**[3M]**
		(c) Define Pitch angle.	[L1][CO3]	**[2M]**
		(d) Define axial ratio.	[L1][CO3]	**[2M]**

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UNIT –III
VHF, UHF and Microwave Antennas – II

1	**a**	What are the conditions for effective radiation of the Microstrip antenna?	[L1][CO4]	**[2M]**
	b	What are the applications of Microstrip antenna?	[L1][CO4]	**[2M]**
	c	What are the advantages of cassegrain feed system?	[L1][CO3]	**[2M]**
	d	What are the feed methods for parabolic antenna?	[L1][CO3]	**[2M]**
	e	What is the need for antenna measurements?	[L1][CO5]	**[2M]**
2		**(a)** Give the advantages and limitations of micro strip antennas. **(b)** Explain about micro strip antennas and its types with neat diagrams.	[L1][CO4] [L5][CO4]	**[4M]** **[6M]**
3		**(a)** Write short notes on flat sheet& corner reflector. **(b)** What are the types of reflectors? Explain the features of parabolic reflectors.	[L1][CO3] [L1][CO3]	**[5M]** **[5M]**
4		**(a)** Discuss the construction of rectangular patch antenna. **(b)** A parabolic reflector antenna with diameter 1.8 m is designed to operate at frequency of 6 GHz and illumination efficiency of 0.65.Calculate the FNBW and Antenna gain.	[L2][CO4] [L2][CO2]	**[5M]** **[5M]**
5		**(a)** Draw and explain the principle of parabolic reflector. **(b)** A parabolic dish provides a power gain of 50 dB at 10 GHz with 70% efficiency. Find out i)HPBW ii) BWFN iii) Diameter	[L2][CO3] [L2][CO3]	**[4M]** **[6M]**
6		**(a)** Explain the effect between variation of focal length position and radiation in paraboloid. **(b)** Explain Cassegrain Feed system and give its advantages.	[L2][CO3] [L2][CO3]	**[5M]** **[5M]**
7		**(a)** Explain about the Reciprocity with respect to antenna measurements. **(b)** Explain near & far fields with respect to antenna measurements.	[L5][CO5] [L5][CO5]	**[5M]** **[5M]**
8		**(a)** Explain sources of Error in Antenna measurement. **(b)** Define Radiation pattern and explain the set up for measurement of Radiation pattern of an antenna.	[L2][CO5] [L1][CO5]	**[5M]** **[5M]**
9		**(a)** Write short notes on Coordination system for antenna measurement. **(b)** Explain Gain measurement by direct comparison method.	[L1][CO5] [L1][CO5]	**[4M]** **[6M]**
10		**(a)** Explain the gain measurement using absolute method. **(b)** Explain the measurement of directivity.	[L5][CO5] [L5][CO5]	**[6M]** **[4M]**
11		**(a)** What is a patch antenna? **(b)** What are the applications of Microstrip antenna? **(c)** What is reflector antenna and give its significance? **(d)** Mention different methods of feeds of parabolic reflector antennas.	[L1][CO4] [L1][CO4] [L1][CO3] [L1][CO3]	**[2M]** **[2M]** **[3M]** **[3M]**

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UNIT –IV
ANTENNA ARRAYS & MEASUREMENTS

1	**a**	Define Binomial Array?	[L1][CO4]	**[2M]**
	b	What is the difference between BSA and EFA?	[L1][CO4]	**[2M]**
	c	What are the advantages of Antenna array?	[L1][CO4]	**[2M]**
	d	What is meant by pattern multiplication?	[L1][CO4]	**[2M]**
	e	What is the need for antenna array?	[L1][CO4]	**[2M]**
2	**(a)** What is antenna array? Define point sources and uniform linear array. **(b)** Write short notes on broad side and end fire arrays.		[L1][CO4] [L1][CO4]	**[5M]** **[5M]**
3	**(a)** Explain n- element uniform linear array **(b)** Write short notes on collinear Array		[L5][CO4] [L1][CO4]	**[5M]** **[5M]**
4	Derive the expression for far field pattern of an array of two isotropic point sources at equal amplitude& same phase.		[L4][CO3]	**[10M]**
5	Explain End fire array with increase directivity and derive the directivity equation.		[L5][CO4]	**[10M]**
6	Derive the expression for far field pattern of an array of two isotropic point sources at equal amplitude &opposite phase.		[L4][CO3]	**[10M]**
7	**(a)** Explain pattern multiplication with appropriate examples. **(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 0.25 A. Calculate the radiated power, half power beam width of major lobe.		[L5][CO4] [L3][CO4]	**[5M]** **[5M]**
8	**(a)** Show that Directivity of BSA, L>>d is $D_0=2(d/\lambda)$. **(b)** Show that Directivity of EFA, L>>d is $D_0=4(d/\lambda)$.		[L5][CO4] [L5][CO4]	**[7M]** **[3M]**
9	**(a)**What is principle of pattern multiplication? List the advantages and disadvantages. **(b)** Explain the effect of uniform and non uniform amplitude distributions.		[L1][CO4] [L2][CO4]	**[5M]** **[5M]**
10	**(a)** Compare the Broad side array and end fire array. **(b)** Define Binomial array.		[L5][CO4] [L1][CO4]	**[7M]** **[3M]**
11	**(a)** What are the different types of antenna arrays? **(b)** What are the different cases of arrays of two point sources? **(c)** Find the minimum spacing between the elements in a broadside array of 10 isotropic radiators to a have directivity of 7db.		[L1][CO4] [L1][CO4] [L2][CO4]	**[3M]** **[3M]** **[4M]**

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UNIT –V
WAVE PROPAGATION

1	**a**	Draw the structure of ionosphere and name the regions?	[L1][CO1]	**[2M]**
	b	What is maximum usable frequency in wave propagation?	[L1][CO1]	**[2M]**
	c	What is meant by Ionospheric storms?	[L1][CO1]	**[2M]**
	d	What is meant by Multi hop propagation?	[L1][CO1]	**[2M]**
	e	Define Skip distance.	[L1][CO1]	**[2M]**
2		**(a)** Explain different modes of Wave Propagation. **(b)** Explain about refraction and reflection of EM waves	[L2][CO6] [L2][CO6]	**[6M]** **[4M]**
3		Draw and Explain the structure of Ionosphere with its typical electron density variation Characteristics	[L5][CO6]	**[10M]**
4		Explain Reflection and Refraction of sky waves by ionosphere	[L5][CO6]	**[10M]**
5		Explain the Structure of Ground wave propagation with neat sketch.	[L5][CO6]	**[10M]**
6		**(a)** Explain critical frequency and its expression. **(b)** Explain Maximum usable frequency with its expression.	[L5][CO6] [L5][CO6]	**[5M]** **[5M]**
7		**(a)** Explain optimum working frequency and its significance. **(b)** Explain lowest usable high frequency (LUHF) and give its significance.	[L5][CO6] [L5][CO6]	**[5M]** **[5M]**
8		**(a)** Explain Virtual height and its significance. **(b)** Explain Skip distance and derive its expression.	[L5][CO6] [L5][CO6]	**[4M]** **[6M]**
9		**(a)** Explain the relation between MUF and skip distance. **(b)** Explain Multihop propagation.	[L5][CO6] [L5][CO6]	**[6M]** **[4M]**
10		**(a)** Explain the energy loss in Ionosphere. **(b)** At a particular day time, the critical frequency observed in E and F layers are 2.5 MHz and 8.5 MHz respectively. Calculate the maximum electron density of both the layer sin cubic meter.	[L5][CO6] [L4][CO6]	**[5M]** **[5M]**
11		**(a)** 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 range for which maximum usable frequency is 10 MHz. **(b)** Determine the maximum usable frequency for a critical frequency of 20 MHz and an angle of incidence of 35^0	[L4][CO6] [L4][CO6]	**[7M]** **[3M]**

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