U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 19EC5PCANT **Max Marks: 100**
Course: Antenna Theory

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	PO	Marks
		UNIT – I			
1	a)	With the help of neat diagram, explain the principle of radiation and radiation mechanism in antennas.	-	-	**8**
	b)	Using the concept of power theorem obtain the expression for received power of a radio communication link.	CO1	PO1	**6**
	c)	An Antenna has a field pattern given by $E(\theta) = Cos\theta Cos2\theta$ for $0 \leq \theta \leq 90$. Find Half Power Beam Width and Beam Width between first Nulls.	CO1	PO1	**6**
		OR			
2	a)	Explain the following with respect to an antenna (i) Radiation Pattern (ii) Beam Area (iii) Directivity (iv)Effective aperture	CO1	PO1	**8**
	b)	The normalized field pattern of an antenna is given by $E_n = Sin\theta\ Sin\phi$ for $0 \leq \theta \leq \pi$, $0 \leq \phi \leq \pi$ and zero elsewhere. Find (i) Exact directivity (ii) Approximate Directivity	CO2	PO2	**7**
	c)	Two space crafts A & B are separated by 100M m. Each has an Antenna with Directivity of 1000, operating at 2.5GHz. If craft A's receiver requires 20 dB over 1pW, Estimate the transmitter power required on B to achieve this signal level, assuming lossless matched antennas.	CO1	PO1	**5**
		UNIT – II			
3	a)	List the features and applications of loop antenna	-	-	**5**
	b)	Derive an expression for radiation resistance of dipole antenna	CO 1	PO1	**8**

		c)	Determine magnitude of $\vec{E}$ and $\vec{H}$ of a half wave dipole antenna operated at frequency of 300 MHz, at a distance of 100m in the broad side plane for maximum radiation. Input Current to antenna is 100 mA. How much average power is radiated by this antenna?	CO 1	PO1	**7**
			OR			
	4	a)	Estimate the radiation resistance of a circular coil of 10 turns with a uniform current distribution at 10 MHz if the radius of the loop is 5cm.	CO 1	PO1	**5**
		b)	Using power theorem to derive the expression for radiation resistance of a short dipole antenna.	CO2	PO2	**10**
		c)	A short dipole antenna of length L= (λ/15) is having a loss resistance of 1Ω. Find its radiation efficiency	CO 1	PO1	**5**
			UNIT - III			
	5	a)	Explain Principle of Pattern Multiplication with an example	CO 1	PO1	**6**
		b)	Analyse linear broadside arrays with non-uniform amplitude distributions. (General Considerations)	CO2	PO2	**8**
		c)	Explain different types of Phased array and mention their applications.	CO1	PO1	**6**
			OR			
	6	a)	Analyze linear array of N isotropic point sources of equal amplitude and spacing. Also obtain expression for null directions, Beam Width between First Nulls(FNBW) and Half Power Beam Width (HPBW)	CO2	PO2	**10**
		b)	Analyze a linear uniform array of 6 isotropic point sources spaced λ/2 distance apart fed with equal amplitude and in-phase input. Sketch the field pattern and find HPBW and FNBW	CO2	PO2	**10**
			UNIT – IV			
	7	a)	Discuss the contacting feeding methods used in Micro strip antenna	CO 1	PO1	**6**
		b)	List and explain any 4 salient features of Slot Antenna	CO 1	PO1	**4**
		c)	Compute the length L, H-plane aperture, flare angles θ_E and θ_H (in E and H planes respectively) of a pyramidal horn for which E-plane aperture $a_E=10\lambda$, path length difference $\delta=0.2\lambda$in E-plane and 0.375λ in H-plane	CO 1	PO1	**10**
			OR			
	8	a)	State Babinet's principle & Use it to obtain the expression for impedance of complimentary screen in terms of impedance of the screen.	CO 1	PO1	**10**

		b)	Explain with neat diagrams the different types of rectangular and circular Horn Antennas. Considering the Pyramidal horn, explain i) flare angle ii) Path length difference and write equations for optimum horn dimensions	CO 1	PO1	**10**
			UNIT – V			
	9	a)	Discuss the feeding methods for parabolic reflectors. Mention their advantage and disadvantage	CO 1	PO1	**10**
		b)	Discuss the features and practical design considerations of the helical antenna with diagram.	CO 1	PO1	**10**
OR						
	10	a)	Describe different feeding systems used for Parabolic Reflectors in detail	CO 1	PO1	**10**
		b)	A right handed monofilar helical antenna has 10 turns, 100mm diameter and 70 mm turn spacing. Compute Half Power Beam Width (HPBW), directivity at a frequency of 1GHz. Also Find the directivity at a frequency of 300MHz.	CO2	PO2	**10**

****