DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Winter Examination-2023

Course: B. Tech. **Branch : Electronics Engineering** **Semester : VII**

Subject Code & Name: BTEXC701- Antennas and Wave Propagation

Max Marks: 60 **Date: 02/01/2024** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Derive an expression for Wave equation.	**Analyze**	**6**
B)	State Poynting Theorem, Derive an expression for same.	**Analyze**	**6**
C)	Explain Polarization and its types in detail.	**Understand**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	Derive an expression for Friis Transmission Equation, and explain how does it describe signal propagation in wireless communication systems?	**Analyze**	**6**
B)	Differentiate between ground, sky, and space wave propagations in the context of wireless communication.	**Analyze**	**6**
C)	Define and explain the concepts of virtual height, Maximum Usable Frequency (MUF), and skip distance in relation to ionospheric propagation.	**Remember**	**6**
Q. 3	**Solve Any Two of the following.**		**12**
A)	Define (a) Radiation intensity, (b) Beamwidth. A normalized radiation intensity of an antenna is represented by $\mathbf{U(\theta)} = \cos^2(\theta)\cos^2(3\theta)$, $(0 \le \theta \le 90^o, 0 \le \phi \le 270^o)$, Find the (i) half power beamwidth in degrees, (ii) first null beamwidth in degrees.	**Evaluate**	**6**
B)	Compare the characteristics of a binomial and Dolph Tchebyshev antenna array.Explain the design principles behind each type and how they affect the antenna's performance.	**Analyze**	**6**
C)	Explain the terms: Radiation pattern, radiation power density, radiation intensity, directivity, gain and antenna efficiency.	**Remember**	**6**
Q.4	**Solve Any Two of the following.**		**12**
A)	Derive expressions for the fields radiated by Hertzian dipole.	**Analyze**	**6**
B)	Describe the Yagi-Uda antenna array, its elements, and the principle behind its directivity and gain.	**Understand**	**6**

C)	Describe the radiation patterns and characteristics of broadside and end-fire arrays. Discuss the applications and advantages of each configuration in specific communication scenarios.	**Analyze**	**6**

Q. 5 Solve Any Two of the following. **12**

A)	Design a log periodic dipole antenna, to cover all the VHF TV channels (starting with 60 MHz for channel 3 and ending with 210 MHz for channel 12) the desired directivity is 8 dB (optimum $\sigma = 0.157$ and corresponding $\tau = 0.865$) and the input impedance is 50 ohms. The elements should be made of aluminum tubing with 3/4 in. outside diameter for largest element and the feeder line and 3/16 in. for the smallest element. These diameters yield identical l/d ratios for the smallest and largest elements.	**Evaluate**	**6**
B)	What are different feeding methods of microstrip antenna? Explain in detail	**Understand**	**6**
C)	Explain the structural design and working principle of antennas with parabolic reflectors. Discuss the radiation pattern and the focusing properties of such antennas.	**Understand**	**6**

***** End *****