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10EC64

**Sixth Semester B.E. Degree Examination, June/July 2023**  
**Antennas and Wave Propagation**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.**

**PART – A**

- 1 a. What is directivity? Get the relationship between directivity and beam width. (08 Marks)  
b. Explain the following terms with respect to antenna  
i) Gain ii) Effective Aperture iii) Radiation Intensity iv) Radiation Resistance. (12 Marks)
- 2 a. Define power pattern. Explain power theorem as applied to the Isotropic Radiator. (08 Marks)  
b. Derive an expression for field strength at a point due to an N-element array. (08 Marks)  
c. Show that directivity of a source with unidirectional radiation pattern given by  $u = U_m \cos^n \theta$  can be expression as  $D = 2(n + 1)$ . (04 Marks)
- 3 a. Derive an expression for Radiator – Resistance of dipole antenna. (08 Marks)  
b. Derive the expression for the field strength  $E_\theta$  and  $H_\theta$  in the case of a small loop. (08 Marks)  
c. Consider an antenna radiating at 100MHz frequency. Compute its length assuming it to be a  $\lambda/2$  dipole. (04 Marks)
- 4 a. Explain Pattern Multiplication. (08 Marks)  
b. Show that the radiation resistance of  $\lambda/2$  is 73ohms. (08 Marks)  
c. Write a notes on Folded dipole antenna. (04 Marks)

**PART – B**

- 5 a. Explain with a neat diagram Horn Antenna. (08 Marks)  
b. Write short notes on Corner Reflector. (08 Marks)  
c. Calculate the power gain of an optimum Horn Antenna whose one side of square aperture is  $a = 10\lambda$ . (04 Marks)
- 6 a. Explain basic operation of Yagi-Uda Antenna. With suitable diagram. List out its characteristics. (08 Marks)  
b. With a neat sketch, explain Log periodic Antenna. (08 Marks)  
c. Calculate the BWFN and gain of a 2m paraboloid reflector operating at 6GHz. (04 Marks)
- 7 a. Explain space wave propagation and derive the expression for space wave field strength. (12 Marks)  
b. Explain with suitable diagrams, 'Duct Propagation'. (08 Marks)
- 8 Write short notes on :  
i) Sky wave propagation  
ii) Maximum usable frequency  
iii) Virtual height  
iv) Skip distance (20 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.