

**Sixth Semester B.E. Degree Examination, Jan./Feb. 2023**  
**Antennas and Propagation**

Time: 3 hrs.

Max. Marks: 100

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

**PART – A**

- 1 a. Explain the following terms:
  - i) Beam area    ii) Directivity    iii) Beam width. (06 Marks)
- b. Derive the relation between effective height, effective aperture and radiation resistance. (06 Marks)
- c. Find the directivity if the radiation intensity is given by  $U = U_m \sin^2 \theta \sin^3 \phi$  using i) exact method    ii) approximate method  $0 \leq \theta \leq \pi$ ,  $0 \leq \phi \leq \pi$ . (08 Marks)
- 2 a. Obtain the field pattern for the two isotropic sources with equal amplitude and opposite phase. The distance between the two sources is  $\lambda/2$ . (10 Marks)
- b. Explain the phase pattern with the help of a figure. (05 Marks)
- c. For a broad side array of 4 isotropic sources of equal amplitude and phase spaced  $\lambda/2$  apart, calculate BWFN and HPBW. (05 Marks)
- 3 a. Derive the expression for the radiation resistance of short dipole knowing the far field components. (08 Marks)
- b. Show that for a N-wire  $\lambda/2$  folded dipole the characteristic impedance is  $70N^2$ . (06 Marks)
- c. Write short notes on long wire antenna. (06 Marks)
- 4 a. State and explain Babinet's principle. (06 Marks)
- b. Derive the expressions for the fields of small loop antenna. (08 Marks)
- c. Write a note on Horn antenna. (06 Marks)

**PART – B**

- 5 a. Discuss the practical design considerations of a helical antenna. (10 Marks)
- b. Write short notes on: i) Log periodic antenna    ii) Parabolic reflections. (10 Marks)
- 6 a. Explain the structure of Yagi Uda array with a neat diagram and explain. (08 Marks)
- b. Write short notes on: i) Antennas for ground penetrating radar    ii) Embedded antennas. (12 Marks)
- 7 a. List out the salient features of ground wave propagation and its applications. (08 Marks)
- b. Derive the expression for the field strength of space waves. (06 Marks)
- c. Explain Duct propagation. (06 Marks)
- 8 a. Derive the expression for refractive index and electron density for Ionospheric propagation. (08 Marks)
- b. Explain the following terms:
  - i) Critical frequency
  - ii) Maximum usable frequency
  - iii) Virtual height
  - iv) Skip distance (08 Marks)
- c. Distinguish between E layer and Sporadic E-layer. (04 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.

