

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:2161003****Date:06-07-2023****Subject Name:Antenna & Wave Propagation****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1 (a)** Define the following terms: **03**
 i) Skip distance
 ii) Radiation intensity
 iii) Beam efficiency
- (b)** Draw and explain the antenna field zone. **04**
- (c)** How does the Friis transmission theory help to determine loss between the two antennas located in free space? Explain with necessary formula and theory. **07**
- Q.2 (a)** Estimate directivity of an antenna with $\theta_{HP}=2^\circ$ and $\phi_{HP}=2^\circ$. Find gain of this antenna if efficiency factor $k=0.6$. **03**
- (b)** Discuss different types of radiation modes of Helical antenna. **04**
- (c)** Write the statement of pattern multiplication theorem. Explain it in detail by using any example.
- OR**
- (c)** Derive the expression of the Radiation resistance of Small loop antenna. **07**
- Q.3 (a)** Describe elliptical polarization. **03**
- (b)** Differentiate broadside and end-fire array. **04**
- (c)** Starting from retarded current, derive an expressions for electric and magnetic components of a short dipole antenna if the spherical system is defined in r , θ and ϕ . **07**
- OR**
- Q.3 (a)** Explain reflector- lens antenna. **03**
- (b)** Derive the equation of effective height of antenna. **04**
- (c)** Explain Frequency independent antenna in detail. **07**
- Q.4 (a)** Explain the principle of Folded dipole antenna with clean and neat figure. **03**
- (b)** An antenna has a field pattern given by **04**

$$E(\theta) = \cos^2 \theta \quad \text{for } 0^\circ \leq \theta \leq 90^\circ$$
 Find the half- power beam width.
- (c)** Explain the experimental setup for the measurement of radiation pattern of antenna under test. **07**
- OR**
- Q.4 (a)** Explain Cassegrain feed with necessary figure. **03**
- (b)** Explain different types of reflector Antennas. **04**
- (c)** Describe various types of horn antenna used at microwave frequency. **07**

- Q.5 (a)** Draw and explain the working principle of slot antenna. **03**
- (b)** Explain the following terms with neat and clean figure: **04**
i) Multi hop propagation ii) Virtual height
- (c)** Explain different modes of propagations in detail **07**
- OR**
- Q.5 (a)** What are inverse and multi path fading? **03**
- (b)** Explain embedded antenna. **04**
- (c)** Design Three element Yag-Uda antenna. Explain how improvement in basic Yag-Uda antenna can be made. Also write the application of Yag-Uda antenna. **07**
