Enrollment No......................................

Faculty of Engineering
End Sem Examination Dec-2023
EC3CO19 Antennas & Propagation

Programme: B.Tech.   Branch/Specialisation: EC

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1
i. What is the measure of the power radiated per unit solid angle in a particular direction? **1**
(a) Radiation power density   (b) Beamwidth
(c) Directivity   (d) Gain

ii. What is the ratio of the maximum radiation intensity in a given direction to the radiation intensity averaged over all directions? **1**
(a) Directivity   (b) Antenna efficiency
(c) Gain   (d) Radiation intensity

iii. The EFA in "EFA with Increased Directivity" stands for- **1**
(a) Extra Forward Array   (b) Enhanced Field Amplification
(c) Endfire Array   (d) Electrically Folded Antenna

iv. An Endfire array exhibits maximum radiation in which direction? **1**
(a) Broadside   (b) Endfire   (c) Bidirectional   (d) Circular

v. One of the following is very useful as a multiband HF receiving antenna- **1**
(a) Conical horn   (b) Folded dipole
(c) Log periodic   (d) Square loop

vi. Cassegrain feed is used with a parabolic reflector to- **1**
(a) Increases the gain of the system
(b) Increases the beamwidth of the system
(c) Reduces the size of the main reflector
(d) Allows the feed to be placed at a convenient point

vii. Which of the following antennas is best excited from a waveguide? **1**
(a) Log periodic   (b) Helical   (c) Horn   (d) Discone

viii. What is the basic structure of a microstrip antenna? **1**
(a) Dipole   (b) Loop   (c) Patch   (d) Yagi-Uda

ix. When microwave signals follow the curvature of the earth, this is **1**
known as-
(a) The Faraday effect   (b) Ducting
(c) Tropospheric scatter   (d) Ionospheric reflection

x. Frequencies in the UHF range normally propagate by means of- **1**
(a) Ground waves   (b) Sky waves
(c) Surface waves   (d) Space waves

Q.2 i. Explain the concept of image theory as it applies to a monopole **2**
antenna.

ii. What is the fundamental assumption in considering an antenna as an **3**
infinitesimal dipole?

iii. Define the Friis transmission equation and its significance in wireless **5**
communication.

OR iv. Explain the conditions under which the Reciprocity Theorem is valid. **5**

Q.3 i. Explain the concept of broadside radiation in the context of linear **2**
arrays.

ii. What are the advantages of an Endfire array in terms of directivity and **8**
beam control? How does the element spacing influence the directivity
of an Endfire linear array?

OR iii. Define non-uniform amplitude distribution in antenna arrays. Explore **8**
the reasons and scenarios where a non-uniform amplitude distribution
is preferred.

Q.4 i. Explore practical applications of loop antennas in communication **3**
systems.

ii. Explain the fundamental principles of paraboloidal reflectors in **7**
antenna systems. What is the significance of the parabolic shape in
reflector antennas?

OR iii. Explore the gain and directivity characteristics of helical antennas. **7**
How do design parameters, such as pitch and diameter, influence the
overall performance?

Q.5 i. Define a horn antenna in the context of base stations. **3**

ii. Explain the radiation pattern characteristics of horn antennas. How **7**
does the design of a horn antenna contribute to achieving high
directivity?

OR iii. Describe the key design considerations for horn antennas used in **7**
mobile stations. How do size and form factor influence the design of
horn antennas for mobile applications?

Q.6 Attempt any two:

i. Define space wave propagation and outline its key characteristics. How **5**
does space wave propagation differ from ground wave propagation?

ii. Define super refraction in the context of space wave propagation. What **5**
atmospheric conditions contribute to the occurrence of super
refraction?

iii. Define the Maximum Usable Frequency (MUF) in ionospheric wave **5**
propagation. How is MUF determined? What factors influence its
value?

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