

**CS/B.Tech/(ECE-New)/SEM-6/EC-604A/2013
2013**

ANTENNA THEORY & PROPAGATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :
10 × 1 = 10

- i) The intrinsic impedance of free space is
 - a) 1 ohm
 - b) 4 ohm
 - c) 120π ohm
 - d) 0 ohm.
- ii) When the polarization of the receiving antenna is unknown, to ensure that it receives at least half the power (except in particular situation), the transmitted wave should be
 - a) horizontally polarized
 - b) vertically polarized
 - c) circularly polarized
 - d) elliptically polarized.
- iii) Microwaves antenna aperture efficiency depends on
 - a) feed pattern
 - b) antenna aperture
 - c) surface losses
 - d) low side lobe level.

- iv) The antenna most commonly used for TV broad in the UHF band is
 - a) turnstile antenna
 - b) dipole antenna
 - c) yagi antenna
 - d) rhombic antenna.
- v) Fields are said to be circularly polarized if the magnitudes are
 - a) equal and they are in phase
 - b) equal and they differ in phase by $\pm 90^\circ$
 - c) unequal and they differ by $\pm 90^\circ$
 - d) not equal but they are in phase.
- vi) The current distribution in half-wave dipole is
 - a) sinusoidal
 - b) constant
 - c) triangular
 - d) parabolic.
- vii) The ground wave field strength is
 - a) inversely proportional to distance
 - b) inversely proportional to the square of distance
 - c) directly proportional to distance
 - d) directly proportional to the square of distance.
- viii) Power and field patterns are related as
 - a) $P \propto E^2$
 - b) $P \propto E$
 - c) $P \propto E^{1/2}$
 - d) $P \propto 1/E$.
- ix) Circularly polarized antenna is
 - a) dipole
 - b) parabolic dish
 - c) yagi-uda
 - d) helical.
- x) Antenna commonly used for microwave links is
 - a) loop antenna
 - b) log periodic antenna
 - c) paraboloidal dishes
 - d) rhombic antenna.

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- xi) A half wave dipole used at a frequency of 300 MHz has a length of
 - a) 10 metres
 - b) 3 metres
 - c) 1 metres
 - d) 50 centimetres.
- xii) A log periodic antenna is a
 - a) frequency independent antenna
 - b) frequency dependent antenna
 - c) directional antenna
 - d) none of these.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- 2. What is antenna gain ? How is it related with directive gain and power gain ?
- 3. Define Yagi-uda antenna and explain its operation.
- 4. Define the following terms :
 - i) Friss transmission formula
 - ii) Duality theorem.
- 5. What are the different modes of radio wave propagation ? What do you mean by fading ?
- 6. Derive the relation between effective area and gain of antenna. Define about noise temperature of antenna.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

- 7. a) What are the vector potential and retarded vector potential ? $2 + 3$
- b) Define gain, directivity and efficiency of antenna. $2 + 2 + 2$

- c) The radiation resistance of an antenna is 80Ω and loss resistance is 10Ω . Determine efficiency, directivity if the power gain is 20. And also find out the beam solid angle. $1 + 2 + 1$

- 8. Find the radiation resistance of a half wave dipole with uniform current distribution. Explain the design aspects of Yagi-uda antenna. $10 + 5$
- 9. Explain special features of parabolic reflector antenna and discuss on different types of feed used with neat diagram. For N -element array show that the first minor lobe is 13.46 dB down from the major lobe. $5 + 4 + 6$
- 10. a) Define MUF, critical frequency and virtual height. $2 + 2 + 3$
- b) At what frequency a wave must propagate for the D region to have an index of refraction 0.6 ? Given $N = 500$ electron / c.c. for D region. 3
- c) In a communication link two identical antennas at 10 GHz are used for propagation of 40 dB. If the transmitted power is 1 W, find the received power, if the range of the link is 30 km. 5
- 11. Write short notes on any *three* of the following : 3×5
 - a) Duct propagation
 - b) Loop antenna
 - c) Sky wave propagation
 - d) Microstrip antenna
 - e) Skip distance.